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SYSTEM OF SURGERY.

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A

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THEORETICAL AND PRACTICAL

IN

TREATISES BY VARIOUS AUTHORS.

EDITED BY

T. HOLMES, M.A. CANTAB.

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By A. Poland, Esq.

SURGEON TO GUY'S HOSPITAL.

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By Charles Hawkins, Esq.

INSPECTOR OF ANATOMY.

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DISEASES OF THE JOINTS.

PART I.

DISEASES COMMON TO ALL THE JOINTS.

In estimating the nature and importance of diseases of the joints, we have to bear in mind that we have to deal with varied structures, distinct in their formation, their functions, and their pathology, but all so far united for a special purpose that disturbance of any one of them is sufficient to derange the harmonious working of the whole. The study of diseases of the joints, therefore, involves to a greater or less extent that of the affections of the *osseous system*, the foundation, as it were, of the articulations; of *cartilage*, *fibro-cartilage*, or *membrane*, interposed between the bones to play the part of the buffers in the railway-train; of *fibrous tissue* or *ligaments*, the coupling-chains; of *synovial membranes* with their *synovia*, the lubricating boxes and grease by which the friction is diminished; as well as of *connective* and *adipose tissues*, which serve as packing material to fill up the hollows. External to the joints, moreover, but still playing an important part in their mechanism, are various muscles with their tendons, as well as synovial bursæ, the pathological conditions of which in their relation to the joints cannot be entirely omitted or passed over.

It is only since the investigation of the diseases of the joints has been pursued in relation to their structural origin (for which we are mainly indebted to the acute intellect and philosophical spirit of Sir B. Brodie), that any precision of diagnosis has been arrived at, any really physiological system of treatment been adopted. The diseases of the joints are no longer lumped together under the vague denomination of 'white swelling,' but referred, with more or less certainty, to the tissues in which they commenced, and connected with the pathological changes which those tissues are found to have undergone. It must, however, be admitted that when disease has advanced to a certain stage, so many of these structures are likely to be involved, that an accurate allotment of the symptoms to their respective sources would be useless even if it were possible; so that, practically, we have often to disregard minute anatomical distinctions, and consider the case mainly as regards its severity and probable termination. It may be remarked, too, that the separation of joint diseases into those which affect the synovial membranes or ligaments, the bones, and the cartilages, is more obvious and more practically useful in adults, in whom these structures have arrived at their full growth, than in children in whom they are still in process of development. As Mr. Hilton justly observes, 'in childhood the separate and distinct disease of the articular structures can seldom be recognised with any useful precision during life.'*

The limits assigned to this essay are evidently insufficient to allow of any complete or comprehensive study of these varied diseases; no more than a sketch can be attempted; but that sketch, it is hoped, may be found sufficient for all practica purposes.

Anatomically all joints are not alike, being divided into th comparatively simple *synarthrodial* articulations, or those devoi of a synovial membrane, and the more complicated *diarthrodial*, in which a synovial membrane exists. Pathologically similar distinction may to a certain extent be drawn, and th affections of the diarthrodial articulations may conveniently b separated from those of the synarthrodial, which will receiv such notice as may be considered necessary in the latter part the essay.

DISEASES OF THE SYNOVIAL MEMBRANES—SYNOVITIS.

Synovial membranes are liable to inflammation, formin what is usually, though not perhaps very correctly, terme *synovitis*.

The inflammation which attacks a synovial membrane ma be of the ordinary character, or it may be modified by certai constitutional conditions. Common synovitis occurs, in man cases, as a local affection from the direct irritation of mechanic injury, or results from undue exercise and exposure of the joint to atmospheric influences; it may also be induced by disease which has involved the adjoining tissues. This form of inflammation is generally confined to a single articulation.

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* See also Holmes, *Surgical Diseases of Children*, p. 411.

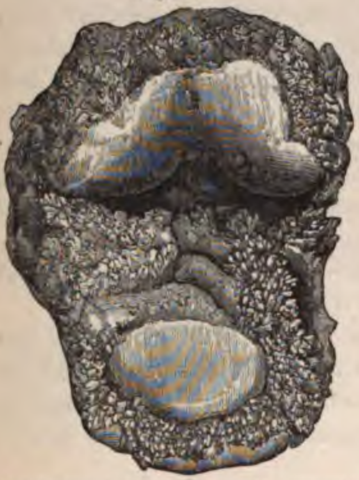
The constitutional conditions which modify the character of the inflammation may be more or less permanent, and even hereditary. Sometimes we find the patient presenting evident marks of *scrofula*, and the local disease sharing in the peculiarities of that affection; in other cases, and principally in the poorer classes, who are ill-clad and unduly exposed to variations of temperature, the *rheumatic* diathesis is apt to prevail; whilst in those who live luxuriously, the local inflammation may be preceded or accompanied by various symptoms of disordered digestion, indicating the presence of an unusual quantity of uric acid in the system, or the existence of the *gouty* diathesis. The constitutional modifications, on the other hand, may result from causes which are obviously temporary. A peculiar form of synovial inflammation, for instance, may occur unexpectedly after parturition, or following some operation, in those in fact who are suffering from what is termed *pyæmia*; or it may take place suddenly during the progress of urethral discharge, when it is distinguished by the name of *gonorrhœal rheumatism*; or, finally, it may manifest itself during the existence of *venereal* poisoning. In all these modifications of inflammation, it may be remarked, there is a considerable chance of the topical disease manifesting itself in more than one articulation.

It will be convenient to commence with a description of the *simple* form of inflammation of a synovial membrane, and its consequences, and afterwards to notice briefly the peculiarities presented by synovitis when *scrofulous*, *rheumatic*, or *gouty*; *pyæmic*, *gonorrhœal*, or *syphilitic*.

Acute synovitis.—Synovitis may be acute or chronic. Acute synovitis, arising in the membrane itself from the causes already alluded to, occurs more frequently in adults than at an earlier period of life, in males than in females.

Pathological anatomy.—The simplest changes which result from inflammatory action consist in increased vascularity of the membrane, especially of its plicæ vasculosæ, followed by increase in the amount of the synovia, and some alteration in its healthy composition. A little later, we find the products of inflammation either effused into the synovial cavity, mingling with and usurping the place of the normal secretion, or situated in the texture of the membrane and in the immediately contiguous tissues. The effusion into the joint-cavity may consist of serum, mixed with shreds of synovial epithelium, and a variable amount of organisable lymph, giving rise to false membranes connected with the walls of the cavity or floating in the secretion; some of the colouring constituents of the blood may also be present. In a large number of cases the inflammation is arrested before much mischief occurs; the vascularity of the membrane diminishes, the effused fluids are absorbed more or less completely, and the joint is restored to its original condition; or it may be left more distended than natural, and liable to fresh effusion; or a certain amount of thickening and loss of mobility may remain permanently.

Fig. 206.



Pendulous growths from the synovial membrane. (From a preparation in the Museum of St. George's Hospital.)

In other cases, however, further changes occur within the joint, giving rise to villous or fringed processes, extending, perhaps, over the cartilages, which may still be found beneath them. At the same time a similar action takes place on the outer side of the membrane, increasing the amount of thickening and consolidation of th capsule. If the inflammator action still proceeds unchecked the fluid effused into the join becomes turbid, and pus i formed, at first scantily, bu afterwards in larger quantities the other structures enterin into the composition of the joi become involved in the disease action; the articular cartilag are affected, ulcerous excavations extend through their su stance, and the articular extremities of the bones participa to a greater or less extent in the disorganising process. Th parts outside the joint-cavity undergo similar changes; degen ration takes place in their newly-formed materials, and a scesses arise there, communicating with the joint by ulcerati extending through the capsule, or making their way to t surface by means of sinuses. The ligamentous structur become thickened or softened, or otherwise altered, so as, in some instances, to be no longer capable of holding together the bones, which may thus become completely or incompletely dislocated.

Symptoms.—The leading symptoms are those of inflammation generally, varying in degree with the amount of synovitis present, with the cause inducing it, with the particular constitutional condition, and with the individual joint affected. The amount of inflammatory fever depends upon the character and extent of the synovitis, and the importance of the articulation, being generally most marked when the hip-joint is the seat of the disease. Locally, we have *pain*, usually of considerable amount, increased by any movement of the part, and often characterised by a feeling of distension. It may be noticed also that the pain in articular inflammations, as in those of some other organs, is not always referred to the region in which the disease actually exists. In diseased hip, for instance, the suffering may be experienced mainly in the knee, giving rise occasionally to mistakes on the part of the careless observer. There is *swelling*, varying with the amount of effusion into and round the joint, and taking the shape not of the articular extremities of the bones, but of the distended synovial capsule, modified by the degree of resistance afforded by the surrounding structures. *Fluctuation*, at least in the more superficial joints, is usually distinct, becoming less so if the disease is prolonged and the inflammatory products acquire a more solid character. *Heat* and *redness* are more or less evident, according to the situation of the joint affected, its proximity to the surface, and the degree in which the tissues external to the synovial membrane are involved. The *position* which is unconsciously assumed in acute articular inflammation is often characteristic of the affection and of the particular joint implicated. To alleviate suffering, by securing rest, the limb becomes more or less rigidly fixed by involuntary contraction of the muscles in its neighbourhood, but, in addition to this rigidity, there is a strong tendency for the joint to become flexed, and for this flexion steadily, though gradually, to increase unless arrested by the surgeon. It has been supposed that the rigidity and flexion are due to over-distension of the joint-cavity by fluid; but the ease with which the joint can be moved, and the increased flexion relieved when chloroform is administered, points rather to undue muscular contraction.

The most rational explanation appears to be that given by Mr. Hilton, in his valuable work *On Rest*, viz. 'that the irritated or inflamed condition of the interior of the joint (say the knee-joint), involving the whole of the *articular nerves*, excites a corresponding condition of irritation in the same nervous trunks which supply both sets of muscles, extensors and flexors; but that the flexors, by virtue of their superior strength, compel the limb to obey *them*, and so force the joint into its *flexed condition*.' * At any rate the effect produced, that is, the position assumed by the limb, is practically of great importance, for it is capable of maintaining or aggravating the disease at the time, as well as of giving rise ultimately to great embarrassment in the event of anchylosis occurring.

In the majority of cases of uncomplicated synovitis, the inflammation speedily subsides, the fluid is absorbed, and the part returns to its normal condition. In others, however, the joint remains somewhat swollen, the synovial membrane is thickened, and the mobility of the part diminished, whilst the patient is left very liable to relapse from exposure to any of the exciting causes of synovitis. Or the acute symptoms may simply diminish, and without any interval of restoration to health the disease may assume the chronic form to be subsequently described. In a certain number of cases, unfortunately, the inflammation, instead of subsiding, increases in severity, and the disease is no longer confined to the synovial membrane, the cartilages and other structures becoming involved, in the manner to be more minutely described hereafter. Such extension is marked by fresh and excruciating suffering, by painful 'jumping' of the limb, as well as by crepitus on moving the joint, as the cartilages become destroyed, and is followed or attended in a large proportion of cases by suppuration.

Acute articular abscess.—*Suppuration in a joint,* however, occasionally occurs also *directly* as a consequence of acute synovitis, the effect frequently of some injury, or in children especially, as the result of acute inflammation supervening on chronic disease of the joint. In this acute form of joint-disease, whether we assign the synovial membrane proper, or some other of the varied textures with which it is more or less blended, as the starting-point of the disease, we may *suspect* the formation of matter, if the inflammation run very high; if one or more rigors occur, followed by exacerbation of the pain and general suffering; and if the tumefaction increase and take on a more decidedly phlegmonous character which extends to the surface. The constitutional disturbance will now be great, the pulse rapid, and the character of the fever will be altered, assuming somewhat of a typhoid form. When suppuration has occurred within the joint, and the case progresses unfavourably, the parts around become speedily affected. Abscesses are formed in the surrounding areolar tissue; at first, perhaps, separate from, but soon communicating with, the articular cavity. The fibrous tissues become softened and yield, the skin gets implicated, and openings form communicating with the joint, and discharging a more or less unhealthy pus. When much disorganisation has taken place within the joint, the most favourable issue to which we can look forward is discharge of the matter, and union of the opposed articular surfaces. The health may now improve. The swelling subsides, the discharge diminishes, and at last ceases, the sinuses heal up, the joint-cavity is obliterated, being filled with newly-formed connective tissue, and the limb is stiffened or completely anchylosed. If, however, the constitutional powers give way, the patient may be worn down by the severity of the pain and profuse discharge; the removal of the source of irritation, by excision or amputation, becomes necessary, or where this is impracticable, life is at last extinguished.

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* Hilton, *On the Therapeutic Influence of Rest*, p.156.

Chronic synovitis may be simply inflammatory in its character, though it occurs more commonly perhaps as a modification of the inflammatory process, dependent on certain constitutional cachexiæ, such as scrofula, syphilis, gout, or rheumatism. In some cases the distinctive characters of each of these varieties are clear and well defined; and no difficulty is experienced in assigning the affection to its appropriate place. In others, however, the boundary-line is not always drawn with precision; and the surgeon finds in these diseases, as in most others, that the definite descriptions necessitated in books are not always borne out in practice. Just as acute disease melts by insensible gradations into the chronic, so the constitutional modifications of inflammation are often imperfectly or scarcely marked. At the bedside of the patient, the surgeon must work out for himself many details; and every case will still offer some special employment for his intellectual investigation. The author ca only point out, as it were, the leading types; he who attempt more bewilders the reader instead of assisting him.

Acute inflammation of the synovial membrane, imperfectl treated, may by degrees assume the chronic form; or commenc ing without any great activity in its symptoms, the inflamma tion may pass into a chronic condition; in the latter cas however, the probabilities are very much in favour of the exis tence of some constitutional taint. The joint is sometime much distended with fluid; and the synovial membrane itsel in protracted cases, loses more or less of its natural structur is over-vascular, and permanently thickened, or converted int a firm and gristly substance. The disease may gradually yiel or it may remain stationary in this condition for a considerab time, and then, under the influence of fresh inflammation, th joint may ultimately become totally disorganised.

The symptoms are much the same as in the acute form disease, only far less severe in their character. The constitution disturbance is comparatively little felt. There is swellin sometimes to a considerable extent, more or less pain is exper enced, and the movements of the joint are often very great impaired. In some instances a peculiar crepitus or crackling felt, or a sensation is communicated to the hand as if a numb of loose bodies existed in the joint, depending, perhaps, on eff sion of plastic material into the cavity, similar to that notic in inflammation of the bursæ and tendinous sheaths. Th simple form of chronic synovitis—the form, that is, not connect with any constitutional taint—usually terminates favourab unless neglected, as is occasionally seen in the labouring classe when attack after attack may occur till at last the joint destroyed, or life itself sacrificed. In cases, too, of long stan ing, where great induration of the soft tissues has occurre complete restoration to a healthy condition becomes at be difficult, and relapses into a state of sub-acute inflammation a of frequent occurrence.

Treatment of acute synovitis.—The treatment to be adopted partly general, partly local. If the inflammation runs very hi and the patient is strong and plethoric, it may be necessary take blood from the arm; at any rate, a brisk mercurial purg tive, followed by salines, with antimony and, perhaps, wi colchicum, will be advisable, or in some cases it may be ex dient to place the system rapidly, but for a short time, under t influence of mercury. Where the patient is less robust, any blood-letting had recourse to should be local; and in all cases, though it will be desirable to keep the liver acting by combining taraxacum with the saline medicines, or by administering occasionally some preparation of mercury, violent purgatives should be avoided, on account of the disturbance to the limb which they necessitate.

The primary and essential condition of the local treatment is complete *repose*. When the inflammation is of moderate extent, mere rest in bed, with the joint supported by a partially distended air or water cushion, will be sufficient. Where the inflammation is severe, and danger of permanent mischief threatens, more decided mechanical support is required. The position to be adopted varies with the individual joint, but in all cases must be that which keeps no ligament, and no part of the synovial membrane, on the stretch, and which, in the event of anchylosis occurring, will allow the limb to be used to the greatest advantage. Supposing the articulation to have already assumed an improper position, it is better to put it right *at once*, even if the existing inflammation is acute; for in unnatural positions the different parts of the joint are kept in a state of undue pressure or of undue tension, either of which interferes with healthy nutrition, and so opposes the curative process. Under the influence of chloroform, the replacement can, at this time, be readily effected.* The splint used should be well adapted to the limb, and be of *sufficient length*; in many cases it is absurdly short, giving no real rest to the joint, and allowing the weight of the parts below to drag upon the ligaments, and tend to produce deformity. In disease of the knee-joint, for instance, to give effectual support, the splint should extend very far up the thigh, and be furnished below with a foot-piece, to prevent the tendency of the foot to fall outwards or inwards, and so produce a corresponding twist of the affected articulation. The points here insisted upon are, of course, applicable not merely to cases of synovitis, but of all diseases of the joints, in which absolute rest is demanded.

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* As Mr. Holmes Coote, at page 85 of his work *On Joint Diseases*, has quoted these remarks for the purpose of adding, 'To this practice I most strongly demur,' I may be allowed to cite the very judicious and forcible observations of Mr. Hilton respecting the mischievous and destructive effect he has over and over again seen produced by allowing the joint to assume or retain the fixed and flexed position induced by involuntary muscular contraction, 'resulting not seldom, I may say, from procrastination, or inexcusable want of courage on the part of the surgeon to rectify it, or from his yielding too easily to the importunities of the patient or his friends, in order to avoid giving pain to the patient. From the time when the limb begins to be flexed starts the mischief, which by-and-by cannot be controlled.' And again, after relating two cases in which amputation had to be performed: 'It seems to me that it is a great mistake not to correct it *at once* when they see an inflamed knee or other joint beginning to be contracted or flexed. I believe their duty is to prevent the increase of the flexion, and so avert the condition which, at all events, led to the necessity for amputation in these two cases.'—Hilton, *On the Therapeutic Influence of Rest*, pp. 161–3. I need not say how heartily I concur in these remarks, in which, it may be noticed, the very words employed in the text about correcting the improper position 'at once' are adopted by Mr. Hilton.

Local depletion may be required to an extent determined by the acuteness of the inflammation and the vigour of the patient. If leeches are applied, it must be remembered that they act not merely by the abstraction of blood they give rise to, but also as derivatives, in consequence of the irritation produced by the bites. The application of leeches immediately over a *superficial* joint may tend, consequently, to increase the inflammation instead of diminishing it. In acute synovitis of such a joint as the knee, therefore, it is better to apply leeches at some short distance *above* the joint, so as to empty the distended vessels below. The same observations would, of course, apply, should cupping be employed instead of leeches.

After, or in many cases in place of, the local depletion, various emollient applications may be used. As a general rule, warm fomentations and poultices are the most successful in relieving pain. Occasionally, however, cold is more grateful to the patient. Whichever is employed, uniformity of temperature is much to be desired; the joint should not be exposed to frequent changes, but the applications should be maintained constantly at or near the same standard. It is on this principle that wrapping the joint in cotton wool, or covering it with ointments which exclude the air, is often of service. If cold be applied, it may be used as directed by Dr. Esmarch,* in the form of ice contained in bags of vulcanised india-rubber (far preferable for many reasons to bladders), separated from the limb by a piece of lint. If this prove too heavy, a simple apparatus may be contrived, by suspending, at a suitable angle, from the cradle placed over the affected limb, a bottle containing cold water, in which a few threads are partially immersed, with their ends hanging out of the mouth of the bottle; these, by capillary attraction, will keep up a constant drip upon a piece of lint covering the inflamed joint, and the supply of fluid may be so regulated, by varying the number of threads, as just to compensate for the loss by evaporation, and prevent the rag from ever getting dry. Such an arrangement I frequently used with advantage at the Hospital for Sick Children, both in cases where acute inflammation already existed, and in others where its occurrence might be anticipated in consequence of operations. The cold should be maintained without intermission, as long as any abnormal increase of temperature exists, provided it appears grateful to the feeling of the patient.

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* *On the Use of Cold in Surgery*, New Syd. Soc. 1861.

Treatment of acute abscess of joints.—If there is reason to believe that acute inflammation of the synovial membrane has proceeded rapidly to suppuration, the fact may be verified, at least in the more superficial joints, by the introduction of a needle-trocar. Supposing matter to be found, if situated outside the joint an early incision may prevent the pus making its way into the joint-cavity; and if inside the articulation, the urgency of the symptoms will seldom allow of much delay. It is better, therefore, when the situation of the joint admits of it, to evacuate the matter as early as possible by a free incision, which may be made under the protection of lint steeped in carbolic oil, and the wound afterwards dressed on the antiseptic principle, as practised by Mr. Lister. The opening in such cases is usually attended with marked relief; but fresh incisions may afterwards be made, or a drainage-tube introduced if any obstacle to the exit of pus shows itself. During this time the most perfect rest must be observed, and the limb maintained accurately in position by splints of sufficient length, moulded, if necessary, to the requisite form. Great attention must also be paid to the general health, and the strength supported as the activity of the inflammatory fever subsides.

If the matter within the joint decomposes without escaping freely, absorption of some of its putrid constituents may occur, showing itself by the irritative or typhoid character of the fever. In many cases life is now so evidently at stake, that removal of the diseased part either by amputation of the limb, or, in exceptional instances, by excision of the joint, becomes imperatively called for. In other cases, after providing as far as possible for the free evacuation of the pus, weak iodine injections may be used, not merely to modify the action of the secreting membrane, but also to improve the character of the matter. With care and attention on the part both of the surgeon and the patient, acute suppuration of joints from synovitis may often be expected to terminate favourably, especially in children; but as more or less stiffness of the joint must be expected, special attention should be paid from the first to the position of the limb, instead of waiting, as is sometimes done, till anchylosis has taken place, to remedy the deformity which has been allowed gradually to arise.

Treatment of sub-acute and chronic synovitis.—Instead of giving rise to the formation of abscess, the acute inflammatory symptoms usually subside. As this change occurs, the antiphlogistic treatment is modified; some blood may still be abstracted by leeches applied directly over the part, and cooling applications may be used, or counter-irritation may be had recourse to, in the form of blisters, to produce a discharge of serum from the vessels of the skin. Blisters may be used earlier in inflammation of the deeper-seated joints than where the superficial articulations are implicated; for in the latter the small amount of intervening tissues allows the irritating action to be propagated to such an extent as sensibly to affect the synovial surface acute inflammation of which may be again excited under th influence of too severe or too early a stimulus. In synovitis therefore, of the superficial joints, blisters should not be applie too hastily, and when used may be placed some little distanc above the inflamed spot; it is better also to employ a successio of 'flying' blisters rather than keep *one* open by irritatin applications. Following the blisters, or in place of them various stimulating liniments may be used, or the parts painte with concentrated tincture of iodine. As the inflammator symptoms subside, in those cases especially where some thicke ing of the membrane has occurred, we combine a moderat amount of compression with our support of the part; this ma be done by applying alternate layers of bandage and adhesi plaster with or without camphorated mercurial cerate next t skin, in the way described as 'Scott's bandage.' Sometim the bandage is starched, but care should then be taken, if a fresh outburst of inflammation occurs, that the bandage can promptly removed, if necessary, by the patient. In some cas it is useful to employ splints made of cow-hide, softened warm vinegar, moulded to the form of the joint, and fasten on the limb after having been lined with chamois leath

Many similar contrivances will probably suggest themselves to the surgeon's mind.

If rest be a primary necessity in the acuter stages of inflammation, a time comes at last when this has to be discontinued, and passive motion of the joint substituted in its place; but the exact time when this change is to be made, often requires great judgment and discrimination. The mere presence of pain on motion is not always decisive of the necessity of rest, for in some cases, after long confinement, pain and aching are actually relieved by free and even strong movements.

A distinguished artist, for instance, came under my care for disease of the right wrist-joint following exposure to cold and wet. The inflammation had been severe, and the joint had been kept at perfect rest for several months, but still great aching and pain were complained of, the part was puffy, stiff, and sensitive, though not warmer than natural, and the patient in despair of ever again being able to follow his profession. With some degree of caution I removed the splints and employed passive motion, gradually increased in force, strong friction to the part, and localised galvanism to the individual muscles of the fore-arm, which had become rigid from confinement like the joint itself. The pain subsided under this change of treatment, and by degrees perfect motion was regained, so that the artist has been enabled to resume his profession with no impairment of his technical skill.

Perhaps the best indications for substituting motion for rest in those cases in which pain continues severe after active disease has subsided, are the comparative low temperature of the joint, and the tendency of the integuments to become dusky and puffy.

The treatment sketched out has been that proposed for disease of the synovial membrane itself; the treatment of those cases in which the bones and cartilages become involved will be alluded to subsequently, in the sections treating of diseases of those tissues.

Dropsy of joints.—We occasionally meet with cases in which the synovial membranes are very greatly distended with fluid, whilst few or no other symptoms of inflammation are present. The affection, therefore, has been compared to dropsy of serous membranes, especially that of the tunica vaginalis testis forming hydrocele, and has received the special name of *hydrops articuli.* I have placed it, however, immediately after ordinary synovitis, because in almost all the cases where an opportunity has been afforded of examining the joint, the lining membrane has been found somewhat thickened and unusually vascular, especially in the situation of its vascular processes. The fluid differs from ordinary synovia, being transparent and of a yellowish colour, but presenting no appearance of 'threads,' though it coagulates on the application of heat; in fact, it closely resembles the fluid met with in ascites or in hydrocele. All synovial membranes are not equally subject to dropsy, which usually affects those of considerable extent, and in which the secretion is naturally abundant. It is most frequently found in the knee, sometimes in the elbow, very seldom in any other articulation. Hydrops articuli is scarcely ever a primary affection. It may follow an acute attack of synovitis, and is apt to recur in persons of weak and irritable constitutions, when once the membrane has been over-distended. In such persons the immediate attack may be induced by exposure to cold or very slight violence, or even by some less obvious constitutional disturbance.

The effusion takes place very rapidly, and forms a tumour, whose limits are those of the synovial capsule. Its character may generally be easily recognised by the shape of the swelling and its ready fluctuation. There may be some slight symptoms of inflammation present; but usually, though the limb is somewhat stiff, it may be used with scarcely any pain, even from the first, and the parts external to the capsule show no traces of redness or œdema. From thickening of the joint due to effusion of plastic lymph, hydrops articuli is distinguished by the fluctuation which, as M. Bonnet remarks, is best recognised by placing one hand above and the other below the tumour; if they are placed transversely, the displacement of the muscles or tendons may be mistaken for the movement of fluids. From abscess of the joint, it may usually be distinguished by the condition of the soft parts around as well as by the constitutional symptoms, though it occasionally happens that the true nature of the effusion can only be determined by puncture with a needle. The prognosis in these cases is most favourable; at least, the other structures of the joint seldom become involved, though the disease itself may be difficult of cure and very prone to relapse, especially in cases of some standing.

Treatment.—If any inflammatory symptoms are present, these must first be subdued by the ordinary constitutional remedies; by leeches and fomentations, or by cooling lotions. When all traces of inflammation are subdued, and the affection has assumed the chronic form, the joint may be blistered, or painted frequently with a strong solution of iodine; this may be followed by compression by means of adhesive plasters and bandages, accompanied by stimulating and mercurial applications directly to the skin, for the purpose of promoting absorption. If the case is recent, under such treatment the effusion may be expected to subside; but it will still be necessary to support the relaxed membrane by wearing a laced or elastic knee-cap for an almost indefinite period.

In old and neglected cases, on the other hand, the affection resists all ordinary treatment, and must either be abandoned as incurable, or further and operative measures had recourse to, the most promising of which are iodine injections, employed as in cases of ordinary hydrocele. Should it be considered advisable to have recourse to this plan, and the knee be the joint affected (as is most commonly the case), the spot selected for the puncture is that part of the synovial membrane which is situated above and external to the patella; the limb should be in the extended position, and the opening rendered valvular by pulling aside the skin before introducing the trocar, which should be only of moderate size. The fluid injected may consist of tincture of iodine more or less diluted. In a case of hydrarthrosis of both knees in which a permanent cure was effected by this injection, after all other treatment had failed, Mr. Goodall* used equal parts of the tincture and of water, whilst Schuh,† who has employed this treatment successfully in three cases, made use of one part of tincture of iodine to four parts of water. The quantity injected may vary from half an ounce to two or three ounces, the latter quantity being that recommended by Schuh. As much as possible of the fluid is allowed to escape, after being retained in the joint for about five minutes, and care taken to prevent any admission of air to the articulation. When the trocar is withdrawn, the cutaneous wound is coated with collodion. The immediate result of the injection is to produce a certain amount of inflammation; to prevent this from going too far, the limb must be retained in a state of immobility after the operation by means of a properly adapted splint, and the case watched carefully, so that antiphlogistic measures may be had recourse to if necessary. This treatment is only suitable to cases of simple dropsy, uncomplicated with diseased conditions of the bones and cartilages, and would only be advisable when all other measures had failed, and much inconvenience was occasioned by the distended capsule.

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* *British Medical Journal*, No. 367.

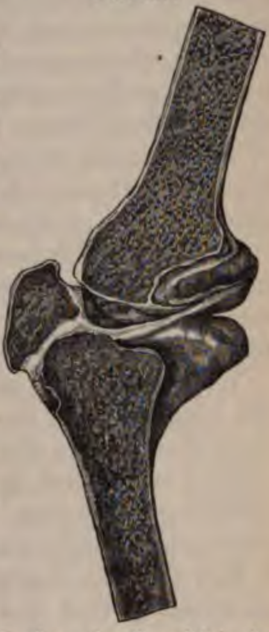
† *Wien. Zeitsch.* N. F. vol. iii. p. 5.

Scrofulous synovitis: pulpy degeneration.—There is a peculiar form of slow inflammation of the synovial membranes, which is sometimes described under the name of *gelatinous* or *pulpy degeneration of the synovial membrane*, but which appears to be inflammation of a chronic character, modified, possibly, by the scrofulous condition of the system. If we have an opportunity of examining the joint when the disease has advanced to a certain extent, the principal points which attract attention are the thickening of the synovial membrane, and the gelatinous pulpy appearance which it presents. The vascularity of the membrane is increased, and the mass of its substance appears to be converted into a soft yellowish or light-brown gelatinous material, frequently of very considerable thickness. The articular cavity becomes diminished as the thickening extends upon the *internal* surface of the membrane; and as this extension goes on most freely in the loose synovial folds which surround the cartilages, these are often partially or completely buried and concealed beneath the new formation. A somewhat similar process occurs at the same time in the areolar tissue at the *outer* surface of the membrane, which becomes condensed and infiltrated with a corresponding pulpy substance.

The joint may remain in this condition for a considerable period, and then, under favourable circumstances, a process of restoration occurs, the new elements shrink or are absorbed, and the articulation is restored more or less perfectly to its former condition. More frequently, however, the disease makes further progress; the gelatinous thickening of the synovial membrane extends further over the cartilages, which become themselves secondarily affected in spots; though these spots are not, necessarily, at first, in *direct* relation with the altered membrane. The precise nature of the change which occurs in the cartilage will be considered in the description of the diseases which affect that structure; it need only be said here that the cartilage becomes more and more altered at the points first affected, and that intimate adhesion soon takes place between the granulation-tissue which these points present and the corresponding growth from the synovial membrane. The change in the cartilage is attended or followed by inflammation of the bone on which it rests; the articular lamella gives way in places, a communication between the osseous tissue and the interior of the joint is formed, and granulations spring up from the inflamed membrane lining the cancelli, which join with those already existing within the articulation. In the mean time matter has most probably been formed, which may be retained within the articular cavity, or may make its way to the surface by means of sinuses.

If the disease still makes progress, the gelatinous growth continues to extend in an outward direction, or it degenerates in patches, giving rise to fresh formations of matter in its own substance or in the articular cavity; the constitutional powers now probably fail, the tissues of the joint, including the osseous, are still further destroyed, and amputation or excision is had recourse to, or the patient dies hectic. When, on the other hand, an improvement takes place, the new growth is directed inwards towards the articular cavity, which it tends to fill up. As the constitutional powers improve, the gelatinous material becomes firmer and more fibrous, it continues to contract, the cavity within it diminishes and is obliterated, the bones are united by a firm and solid substance, and the joint is anchylosed, as in the accompanying figure.

FIG. 207.



Section of a knee-joint, the bones of which are united by ligamentous tissue after scrofulous disease. (From a preparation in the Museum of St. George's Hospital.)

Symptoms. — Pulpy degeneration makes its appearance most frequently in early life, at or before the time of puberty, though no period of life can be said to be absolutely exempt from risk of its occurrence. In many instances the immediate attack can be traced to some slight accident or other local source of irritation; in others no such cause can be discovered, the attack appearing to commence, as we may say, spontaneously. It is characterised by a want of acuteness, even at its commencement, the earliest symptom noticed (supposing the disease to be in the lower extremity) being slight limping, followed by some swelling about the joint.

The nature of the affection is most clearly recognised in those joints which are the most superficial. In its early stages it is characterised by stiffness of the joint, and the presence of a soft, elastic, colourless swelling, occupying the whole extent of the articulation. The absence of genuine fluctuation should prevent the disease from being mistaken for dropsy or abscess of the joint; the size and doughy feel of the swelling distinguish it from simple synovitis; whilst its whiteness is opposed to the darker tint which is usually met with in malignant disease. The early stages of the swelling are usually accompanied with comparatively little pain, the disease in many cases being very insidious in its progress; in this respect, as well as in the shape of the swelling, which extends equally over the whole joint, instead of being specially manifest in the situation of one of the bones, differing from disease commencing in the cancellous structures. If the progress of the case is towards recovery, the swelling ceases to increase, solidifies slowly, and gradually diminishes in size, the pain at the same time yielding, and the condition of the general health becoming much improved. Even if arrested in this early stage, a considerable amount of loss of free movement of the joint must be expected, and great care taken that no recurrence of the symptoms is produced by too early exercise.

When the disease advances, the enlargement and stiffness of the joint increase; the pain, which was previously perhaps little more than a sense of aching or feeling of fulness, becomes more marked and altered in its character, being now described as a 'jumping,' 'gnawing,' or 'starting' pain, and felt with special acuteness at night-time. This change may be considered as a sign that the disease is no longer confined to the synovial membrane; that the cartilages are becoming ulcerated, or rather, more strictly speaking, that the bone on which those cartilages rest is itself participating in the inflammatory action. Another symptom, which would indicate a considerable amount of destruction of cartilage, is the existence of crepitation on any movement of the joint by the patient himself or by the surgeon. This crepitation, however, it should be recollected, may disappear or be masked at any time in consequence of soft and extensive granulations rising from the bones, and preventing their articular surfaces from rubbing on each other. The limb is now in danger of becoming rigidly fixed by spasmodic contraction of the muscles, causing it to assume positions varying in the different articulations, but all tending to produce future embarrassment, unless carefully watched and guarded against.

Before the disease has advanced to this point, in the majority of cases suppuration has occurred, either infiltrating more or less extensively the gelatinous mass, or limited so as to form circumscribed abscesses in its substance, or accumulated in the remains of the synovial cavity. If collected within the joint, there will be a general increase of the swelling, with throbbing pain, and perhaps fluctuation, attended by febrile disturbance to a greater or less extent. After a time the matter makes its way through the softened walls, and 'pointing' takes place at spots determined by anatomical peculiarities referable to the individual joint; the sinuses so formed presenting subsequently large and flabby granulations. When the abscess is situated in the gelatinous mass itself, the increased swelling instead of being general, takes place at any part of the mass which may happen to be the seat of the degeneration, and the opening forms at or near this point. In most cases, however, even when the joint-cavity was originally free, it becomes involved subsequently in the parietal abscess.

In proportion to the deterioration of the constitution will be the extension of the destructive action. The ligaments and neighbouring parts become softened and destroyed, the altered extremities of the bones are no longer firmly united to each other, and in this condition a partial or complete dislocation is occasionally produced under the influence of spasmodic muscular action; this dislocation being often attended with decided relief to the severity of the symptoms. If the constitutional powers improve, it is still possible for a process of repair and recovery to occur. The discharge in such cases diminishes, the openings contract and ultimately close, the skin resumes its natural appearance, while the swelling decreases and becomes more solid. The diminution in size of the joint continues till it becomes even smaller than it was before the attack, and the skin presents a peculiar puckered appearance around the articulation and at the seat of the cicatrices. The restorative process is of course attended with anchylosis, fixing the limb in the position it may have been allowed to assume.

This form of disease has generally been supposed to be strumous in its character, and connected with the scrofulous diathesis. Mr. Holmes,* however, has questioned its constitutional origin, and advanced many excellent reasons for doubting whether, in a large proportion of cases at any rate, chronic joint-disease may not simply be the result of some local injury or irritation, and essentially independent of any general cachexia, though strumous persons would be at least as liable to it as others. At any rate, as Mr. Holmes justly remarks, 'whatever our views may be as to the pathological question, I think we must all agree that practically we have no such proof of the constitutional nature of any of these chronic joint-affections as should lead us to refuse to entertain the general question of operative treatment. Individual cases must be judged of by their own symptoms.'

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* *Surgical Treatment of Children's Diseases*, pp. 424–7.

Treatment.—In our treatment we have to bear in mind that we are dealing with an affection originating in inflammation, but that inflammation of a chronic character and not improbably modified and altered by the strumous diathesis. Our efforts consequently have steadily to be directed to the improvement of the constitutional condition. Good air and plenty of it, warmth and light, attention to cleanliness and proper diet, are in all cases clearly inculcated. Where the tendency is to *scrofulosis*, the liver and bowels are usually sluggish, and require to be stimulated occasionally by tolerably brisk purges, combined with quinine; whilst in *tuberculosis*, purgatives must be given with caution, and be of the mildest character. In both cases, tonics and especially cod-liver oil, are of service; though these tonics should be administered with judgment, and in relation to the presence or absence of inflammatory fever.

The essential part of the local treatment consists in the joint being kept in a state of perfect and continuous *rest*, by means of splints, which should be well and properly made, and constructed so as completely to prevent any motion of the limb and at the same time admit of any topical applications which may be deemed advisable. As the chance of anchylosis occurring is more considerable than in cases of ordinary synovitis the *position* of the limb becomes of even greater importance though it is to be regulated on the same principles. The splints may be made of leather or of pasteboard, or constructed of wire in the mode recommended by Bonnet and by Syme. I made of iron wire, a strong piece is bent to the shape of th limb, extending on both sides and united transversely to such an extent as to give the requisite degree of strength. Th splint so formed is carefully lined with soft leather, or fitted with a kind of cushion, and will often prove highly useful Too much attention can hardly be paid to the selection and adaptation of the splint in the first instance, and to the necessity of its being worn uninterruptedly for a very long period of time. If inflammatory symptoms are present, it may be necessary to employ a few leeches, or to use cooling or warm applications, as may seem expedient. As the inflammatory symptoms subside, counter-irritants may be had recourse to; these, however, should be employed with some degree of hesitation, and with the cautions previously pointed out as specially applicable to their action on the superficial joints. At the Hospital for Sick Children I became latterly more sparing in my use of them. Mr. Barwell,* however, strongly recommends the employment of the actual cautery in these cases, when the first symptoms of inflammation have somewhat subsided, but when some such action still continues, and enlargement is still going on. The iron is to be white hot, and applied in lines, about an eighth of an inch in breadth and three inches in length, parallel to the axis of the limb. Four such lines are recommended for the knee, two on each side of the patella, at least an inch apart; dry lint may be applied immediately after the cauterisation. The advantage of this plan, according to Mr. Barwell, consists not merely in its acting as a counter-irritant, but also in the pressure produced subsequently on the subjacent parts by the contracting cicatrices. Extension by means of weights, as described in a subsequent part of this essay (see p. 49), is also of considerable service in many cases where the joint affected is in the lower extremity.

Where the disease is confined to the synovial membrane, and has assumed an entirely passive condition, measures may be properly adopted to produce absorption of the indolent gelatinous mass. Such measures would obviously consist in *friction, passive motion*, and accurately applied *pressure to the part.* These means, as pointed out by M. Bonnet, may be freely adopted, but still with care and caution, and at once abandoned if symptoms of renewed activity in the disease show themselves. If any camphorated mercurial application is used to the part, along with the pressure, in the way described as 'Scott's dressing,' it should be employed in these cases very sparingly, and in a very diluted form; the joint, too, should be examined frequently, to make sure that no fresh attack of inflammation has occurred. As the case progresses towards recovery, friction and passive motion are more freely used, and the treatment assimilates to that of ordinary chronic synovitis. Should suppuration take place within the joint, the matter must be evacuated by free incisions made in depending positions, followed subsequently by slightly stimulating lotions to the sinuses, and moderate pressure to the joint, which is still to be maintained in a state of perfect rest, as well as in a suitable position. If the health give way, or the strength appear unequal to bear a long-continued discharge, and the circumstances of the case be such as not to admit of a prolonged use of the treatment which may be desirable, amputation of the limb or excision of the joint will often become necessary. Should improvement, on the other hand, take place, and cure by anchylosis be effected, we must be careful to employ passive motion in due time to prevent ossification, and maintain the uniting material in its fibrous condition.

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* *On Diseases of the Joints*, chap. v.

Rheumatic synovitis.—In the description of synovitis, it was stated that this frequently arose from exposure to cold, or in connection with other causes loosely spoken of as rheumatic. The synovial membranes and parts about the joints are also liable to suffer in a special condition of the system by which the inflammatory process is materially modified, and which constitutes ‘rheumatism’ properly so called. In acute rheumatism or rheumatic fever, the articular affection, although it may be severe and troublesome enough, is evidently dependent on constitutional derangement, culminating in a kind of inflammatory paroxysm assumed to be connected with excess of lactic acid. Unlike ordinary synovitis, the constitutional disturbance in this case is primary instead of secondary; and though a joint, when attacked, may display signs of severe and acute inflammation, yet these signs will often disappear with extraordinary rapidity, whilst other articulations become as suddenly affected. Acute rheumatism, therefore, being essentially a constitutional malady, falls naturally to the care of the physician, and its description must be sought for in works on medicine.

Chronic osteo-arthritis; chronic rheumatic arthritis; rheumatic gout.—The synovial membranes, as well as the other structures entering into the composition of a joint, are liable to a chronic affection, which has long been practically recognised, though varying names have been assigned to it at different times, or according to the class of joints which it happens to implicate. The term *nodosity of the joints* was the one proposed by Dr.

Haygarth, whose attention was attracted to the hard swellings presented by the smaller articulations of the hands and feet, which at the present day more commonly receive the appellation of *rheumatic gout*. When the larger joints, such as the shoulder, the elbow, or the knee, are implicated, the disease is often termed *chronic rheumatism*; whilst a similar affection of the hip has been described by some authors as the *morbus coxæ senilis*. Dr. Adams of Dublin, however, in his valuable work on the subject, has arranged and classified the varieties of the affection, and proposed the term *chronic rheumatic arthritis*, for which, however, the name *chronic osteo-arthritis* has lately been substituted in the official *Nomenclature of Diseases*. It will be seen that the disease implicates other tissues besides the synovial membrane; and, indeed, the changes which occur in the bones in these cases are so specially marked, that Mr. Barwell considers the morbid action to be in reality a rheumatic ostitis. The first obvious symptoms during life, however, are those in relation with the synovial membrane, and the earliest traces of disease after death have been found to be connected with the same tissue. Cruveilhier, Dr. Robert Adams, and Sir Benjamin Brodie, coincide in the opinion that a chronic inflammation of the synovial membrane is the earliest local result as far as the articulation is concerned; and I have therefore thought it best to notice the affection in the present section.

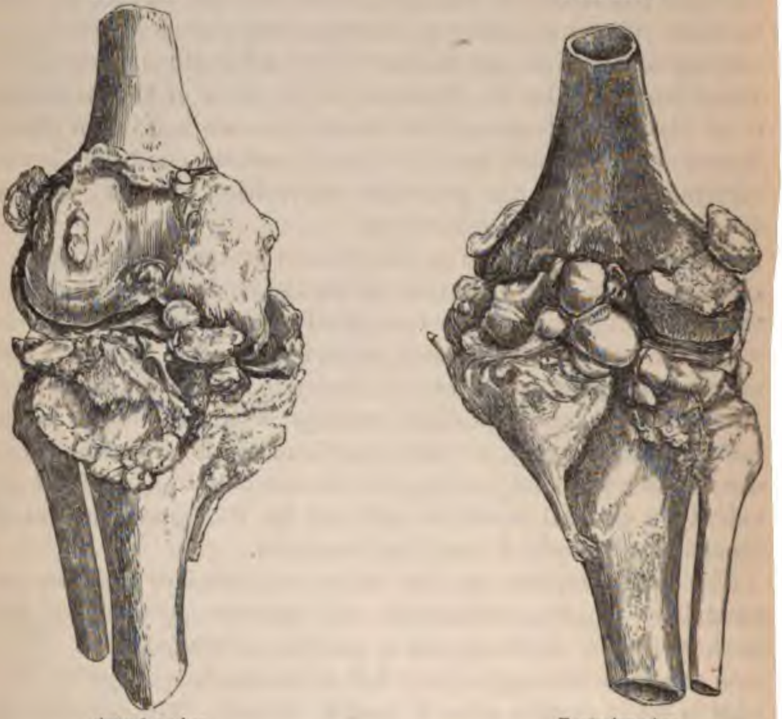
Chronic rheumatism is met with in two distinct conditions: as a palpably constitutional affection, implicating a multiplicity of joints, and either succeeding to rheumatic fever or following exposure to the usual exciting causes of rheumatism; and, secondly, as a local affection attributed to over exertion, or injury, or arising without any assignable cause. The two sexes are, perhaps, nearly equally liable to be attacked; but Dr. Adams is of opinion that the larger joints, especially the hip, are more frequently affected in males, whilst females are more subject to the disease in the smaller articulations, such as those of the fingers; a fact which was originally pointed out by Dr. Haygarth. Though usually met with after middle age, chronic rheumatism is by no means confined to elderly people, for it has been seen in patients under the age of twenty, affecting simultaneously a considerable number of joints. Nor is it confined to any special rank; for though it prevails extensively among the labouring poor, it is also frequently met with in the wealthier classes, in those who have led indolent and luxurious lives, and in whom it is apt to assume a more decidedly gouty character. Though chronic rheumatism materially diminishes the *comfort*, it does not appear to shorten the actual *duration* of life, at least in those whose means allow them to be supplied with all requisite appliances; the very poor, however, are exposed to accidental or extraneous maladies, from the helpless condition to which they are reduced, and so with them the chances of life are diminished. When once the disease has become established, its tendency is to progress, slowly but surely, until the joints affected become ultimately disorganised to a greater or less extent; sometimes the affection remains quiescent, or stationary, for an indefinite period; but very seldom indeed can anything like a cure be anticipated, and then only when the case has been recognised and the treatment commenced before the disease had made much progress.

As far as the local affection is concerned, if we have an opportunity of examining the joint at a very early stage of the disease, we find redness of the synovial membrane, which becomes thickened and fibrous, whilst its fringe-like processes are much developed, and more vascular than usual, the internal surface of the capsule presenting somewhat of the appearance of a villous mucous membrane. There is also effusion of a moderate amount of fluid within the joint. At a later period, the fluid is absorbed; but the ligaments, which had been distended by the effusion, recover themselves but slowly, laying the foundation, perhaps, of the partial or even complete dislocations which are occasionally produced subsequently by the spasmodic muscular contractions which are apt to occur in certain stages of the disease. The capsules become very considerably thickened, and sometimes a bony deposit may be met with in their substance; in the interior of the joint, too, there may be found one or more of those foreign or extraneous bodies which are noticed separately in this essay under the head of Loose Cartilages. The articular cartilages by this time are probably affected; at certain points they assume a yellowish hue, and become fibrous. As the disease progresses, they are destroyed to a greater or less extent; sometimes presenting patches of dense bone, which are smooth and glistening; whilst at other times the cartilaginous tissue disappears entirely, and in its place we find a compact ivory-like bony material, which soon becomes highly polished under the influence of the attrition to which it is subjected, or is marked with linear furrows, resulting from the increased wear to which it is exposed in certain situations in the movements of extension and flexion. In the hip-joint, the round ligament, and in the shoulder the tendon of the long head of the biceps, or the glenoid ligament, will often be removed by the process of absorption. The proper osseous structure becomes condensed beneath the articular surfaces and bony vegetations are thrown out around them, forming buttresses which interfere with the movements of the joints by their mutual apposition. The shape of the articular surfaces is altered; the globular heads of the femur and humerus are flattened, and, as it were, crushed, and the cavities for their reception exhibit a corresponding change, resulting in varying amounts of deformity. These alterations have sometimes been mistaken for fracture of the neck of the humerus, or of the cervix femoris, in which bony union had taken place. It may be mentioned, too, that the abnormal condition is not always confined to the articular extremities, but may involve the shaft, or even the entire bone.

The general symptoms in these cases present no very special character. In some instances, as Sir Benjamin Brodie remarks, the disease appears to be connected with over-indulgence in animal food, and the patient experiences some of the usual effects of dyspepsia, such as a tendency to acidity and flatulence. In other cases, and especially, perhaps, where the larger joints are implicated singly, no particular constitutional derangement can be detected, and, indeed, it is remarkable to how slight an extent the general health is affected by the great amount of topical mischief which may have occurred.

The local symptoms are the most characteristic, and consist essentially of *pain*, *enlargement and ultimate deformity of the joint*, *rigidity or stiffness*, and a peculiar *crackling noise*. The pain experienced is principally felt at night-time, or when the joint is set in motion after a period of rest. The amount of pain, which is usually of an aching character, is far less than might be expected from the amount of structural alteration which occurs, and very different from that experienced in other affections of the articular ends of the bone implicating the joints. When only a single articulation is involved, the general suffering is not great, and the patient's condition is very tolerable; even when several joints are attacked, the amount of pain experienced may be only trifling, though it may become aggravated, especially under the influence of cold and humidity, and of atmospheric changes, to such an extent as to render rest almost impossible. In the earliest stages, when the enlargement depends probably on increased effusion into the synovial membrane or the bursæ in its neighbourhood, the swelling is soft, and fluctuation may sometimes be detected. At a later period the swelling becomes hard, and osseous growths may often be felt connected with the periosteum and extremities of the bones, which lead to alterations in the form of the articular surfaces, and give rise to great and peculiar deformity, varying in the individual joints, but characterised in the smaller ones, such as those of the fingers, by the appearance of irregular knots; whence the term *nodosity of the joints*, proposed by Dr. Haygarth. The accompanying illustrations from a preparation in the Museum of the Middlesex Hospital, show the changes in the shape of the bones, the eburnation of the articular surfaces, the copious deposit on the

FIG. 208. FIG. 209.



Anterior view. *Posterior view.*

Chronic osteo-arthritis of the knee-joint. (From a preparation in the Museum of the Middlesex Hospital.)

bones in the neighbourhood of the joint-ends and the numerous additamentary bones which are met with in old cases of osteo-arthritis. The case is related by Mr. De Morgan in vol. xix. of the Pathological Transactions, where also a drawing will be found showing the extraordinary change of shape which had occurred in the upper end of the femur.

It may be noticed that there is little or no tendency to suppuration in these cases; abscess of the joint rarely, if ever, taking place. The amount of articular rigidity which occurs is peculiarly striking, rendering the affected joints practically useless, and simulating anchylosis, though true anchylosis rarely, if ever, occurs. In the advanced stages of the disease, stiffness or even immobility of the articulations may be present, depending on the deformity which has occurred in the articular surfaces, and on the bony outgrowths which have formed; and where many joints have been affected, the unhappy patient may be confined to his bed in a state of utter helplessness. Though the muscles are not immediately implicated in the rheumatic affection, at some period of the disease, probably when the bone itself begins to suffer, painful spasms are apt to occur, contributing materially to the discomfort of the patient, and giving rise in some cases to the partial or complete luxations which are occasionally met with. When the joints have become rigid and practically useless, the muscles in the neighbourhood degenerate and waste. The sensation of decided crackling experienced in the movements of the joint is evident both to the patient and to the surgeon, and is usually most marked when the articulation is first used after repose; it is especially noticed, therefore, in the morning. It depends upon the mutual attrition of the altered articular surfaces, and may be detected in most of the joints, but especially in the hip, and only disappears when complete rigidity has supervened.

Treatment.—Dr. Haygarth, to whom we are indebted for our earliest notices of this disease, lamented the scanty means of treatment which he could suggest, and hoped, when time had been afforded for investigation by the profession, that fresh and more successful curative measures might be discovered. These hopes, however, have as yet been only partially realised; and in the advanced stages of the malady, when the joint has been essentially disorganised, we can scarcely anticipate much improvement. Our treatment, therefore, to be of real service, must be adopted at the commencement of the affection; at a later period we can but hope to mitigate the symptoms, to relieve the sufferings, and, at best, to retard the progress of the disease. In the early stage, when inflammatory symptoms are present, and any movement of the joint is attended with acute pain, it may be necessary to employ cupping or leeches, to keep the part at rest, and support it by means of bandages or splints. Care, however, must be taken not to prolong too far the period of immobility, for in these cases especially, want of exercise of the joint has ere long a deleterious influence on its structure. When the acuter symptoms subside, therefore, and rigidity increases, the patient should be encouraged to use the limb, to promote polishing and induration of the articular surfaces. Warmth and friction to the part are usually grateful. Flannel should be worn; and shampooing may be employed, or local douches or hot-air baths had recourse to. At certain stages of the affection counter-irritation may be used in the form of blisters or of painting with iodine; and in the nodosities of the fingers, the local application of a solution of iodide of potassium under oiled silk is sometimes of service; or cod-liver oil may be applied externally, as recommended by Sir Benjamin Brodie.

The general or constitutional treatment must be adapted to the individual case, and to the stage at which the disorder has arrived. Where any gouty element exists, where dyspeptic symptoms are present, and the case appears connected with too full a habit, great attention to the diet becomes of importance; stimulants should be abstained from; sugar, fruits, and raw vegetables avoided; and a moderate quantity of potash or magnesia be administered three or four hours after each principal meal. In other cases, however, the system appears impoverished rather than too full, and here it may be necessary to employ a better and more nutritious diet. In the earlier stages of sub-acute inflammation, it may be advisable to give a few alterative doses of blue-pill, combined, perhaps, with acetous extract of colchicum, and to administer Gregory's powder at night-time, with an active aperient at regular intervals. Perspiration should be encouraged, too, by the use of the Turkish or hot-air bath, or by taking Dover's powder, or other medicines to act upon the skin. When the urine is clear, Mr. William Adams recommends the use of sulphur externally and internally, and also the free use of dilute phosphoric acid. At a later period, the iodide of potassium may be administered and continued for several weeks at a time, if it appears to suit the patient; for its action in these cases is somewhat uncertain. Various stimulating internal medicines may now be tried, such as turpentine or guiacum; or cod-liver oil may be administered internally as well as externally; opiates also are usually of service for the purpose of procuring rest. Warm clothing should be used; and, where circumstances admit, residence in a warm climate during the winter months materially increases the comfort of the patient. Warm bathing is usually attended with relief; and if practicable, recourse should be had to the mineral springs, such as those of Bath or Buxton in this country, the hot sulphur baths of Luchon in the Pyrenees, Aix-la-Chapelle, Vichy, Ems, Wiesbaden, or Carlsbad on the Continent.

Gouty synovitis.—The gouty diathesis presents some points of resemblance to the rheumatic; in fact the chronic form of alteration of the joints just described is often termed rheumatic gout. The speciality of the gouty inflammation, however, consists in the sudden or 'explosive' appearance of uric acid in the part affected, giving rise to more or less local disturbance. Gouty inflammation of the joints occurs in an acute or in a more chronic form. The acute form of gout requires no description here, as it is essentially a medical complaint, and is amply treated of in medical works. Where gout has assumed a chronic form, however, the local affection may predominate over the constitutional, and such cases may at times fall under the care of the surgeon; they require, therefore, to be briefly noticed.

When gout first attacks a patient, the joint usually recovers its original mobility as the 'fit' passes off; but when repeated attacks have occurred, the restoration becomes more and more imperfect, and at last the articulation loses entirely its capacity for motion. Opportunities of examining the joint at an early stage are not common; but Dr. Garrod is of opinion that gouty inflammation is *invariably* accompanied by deposition of its peculiar salt. Unquestionably, as the disease advances, a deposit of the white, chalky-looking urate of soda takes place, in the substance of the ligaments and in the surrounding areolar tissue, as well as in the neighbouring muscles; or it may occur in the interior of the joint, thickening the synovial fluid, and studding the synovial membrane with small white masses; or in the substance of the articular cartilages, in the form of white spots, resulting from the presence of the crystalline salt in the hyaline structure; or, finally, the urate may be deposited in the bone and in the periosteum. Resulting from this deposit we may expect to find, sooner or later, the tissues themselves undergoing changes; the synovial membrane will be thickened and vascular; the ligaments and areolar tissue condensed; and the cartilages subsequently become softened and are removed, so that the articular surfaces of the bones are exposed and altered.

Whenever a joint is subjected to protracted attacks of chronic gout, it is certain to be permanently injured, either by becoming so rigid that its functions are practically destroyed, or from the formation of *chalk-stones* around it. Chalk-stones—or *tophi*, as they are sometimes termed, from a Hebrew word signifying *concretion*—vary much in their consistence; they may be soft and semi-fluid, or hard as the chalk from which they derive their name. Under the microscope they present bunches of needle-like crystals of urate of soda; and chemically they are composed of that salt, united with a certain amount of animal or earthy matter. A concretion taken from the metacarpus was found by Lehmann to contain—

Urate of soda	52·12
Urate of lime	1·25
Chloride of sodium	9·84
Phosphate of lime	4·32
Cellular tissue	28·49
Water, loss, &c.	3·98
	100·00

Chalk-stones are generally found in the smaller articulations of the hands and feet. They form protuberances, distorting and crippling the articulation, which approach the surface, till the skin over them is thinned, and allows their white colour to become visible. Sir T. Watson relates the case of a gentleman who was in the habit, when at cards, of scoring the game on the table with his chalky knuckles. It may be mentioned, as sometimes facilitating our diagnosis, that there is another situation in which deposits of urate of soda are even more commonly visible than in connection with the joints, namely, in the cartilage of the external ear, in the form of little pearl-like bodies, varying in size from a split-pea to a mere white point, and situated usually about the fold of the helix. Out of seventeen cases in which Dr. Garrod detected gouty concretions, in seven they existed in the ears *alone*, in nine in the ears *as well as* around the joints, and only in one case were they found in other parts, but *not in the ear*. The gouty deposit, which is at first liquid, becomes harder in time from absorption of its fluid parts, and accumulates in many cases to such an extent as to render the joint completely fixed, whilst the neighbouring structures are also inconvenienced by the distension to which they are subjected. The mere presence of the salt in connection with the joint does not appear usually to produce much irritation; after a time, however, inflammatory action, perhaps from a fresh gouty attack, may be set up, the integuments ulcerate, and a discharge, containing the urate of soda mixed with blood-globules, takes place through openings which are often most troublesome to heal. These abscesses, however, it may be mentioned, appear sometimes to act as safety-valves, and their cure is followed by renewed attacks of gout, which had been suspended during the time they remained open. The diagnosis between chronic gouty affections of the joints and the chronic osteo-arthritis already spoken of, is rendered easy when ulceration of the soft parts has occurred, and chalky matter exudes, which can be determined by chemistry to consist of urate of soda. At an earlier period some uncertainty may exist; though the case may be considered gouty, when it comes on after repeated and manifest attacks of gout, and when the gouty diathesis is plainly marked; it may be proved to be so, if a puncture of the swelling with a needle allows of the escape of fluid in which the presence of crystals of the urate of soda is revealed by the microscope: for the existence of this salt forms the specific characteristic of the *gouty* affection, and is never met with in rheumatism or in chronic osteo-arthritis.

Treatment.—As the disease is essentially a constitutional one, the treatment must also be mainly constitutional, and consists in impeding the undue formation of uric acid, as well as in getting rid of the surplus amount of the acid already existing in the blood. For the first purpose the diet has to be carefully attended to; the dyspeptic symptoms relieved as far as possible; the secretions, especially that of the liver, regulated; and the strength of the patient supported in those cases where there is a tendency to loss of tone. To free the blood, we may administer occasionally small doses of colchicum, when the strength of the patient admits of it; but our main efforts are directed to increase the action of the kidneys and skin by means of salines and alkalies. The salines, to be of service in chronic cases of gout, must be given in small doses and very diluted; they should be taken on an empty stomach and some little time before food. The mineral waters, properly selected, offer many advantages for the administration of saline medicines, as well from the state of dilution in which they are found, as from the greater chance of the patient continuing to take them for a sufficient time, while the mind is occupied and the attention diverted by the change of scene and hopeful statements afforded at the various spas. The external use of the waters can also be conveniently and usefully adopted. The spa to be selected must depend to a great extent upon the special characters of the individual case. In some, Carlsbad, Wiesbaden, or Vichy may be recommended; whilst in other cases, Aix-la-Chapelle, Teplitz, Wildbad, and Buxton are more likely to be of service. Where the debility is great, or after a course of other waters has been taken, the ferruginous springs of Schwalbach or of Pyrmont are often beneficial. For those who are prevented from going to a great distance, or who are desirous of feeling their way and seeing which spring is likely to suit them best, a trial of the carefully prepared factitious mineral waters of the spa at Brighton may at times be deemed advisable, and the Turkish bath is often of much service.

It is, however, for the local mischief that the surgeon may principally expect to be consulted. The local treatment will vary according as it is directed simply to relieve the stiffness and rigidity of the joints, or to alleviate any active inflammatory action which may have been set up, with or without the formation of abscess and production of ulceration. To relieve the stiffness, one topical application has, indeed, been already alluded to, in the form of baths of the mineral waters. Where these cannot be had recourse to, weak alkaline lotions, with iodide of potassium, may be applied to the joint under oiled silk, or, supposing the smaller joints of the fingers to be affected, the whole hand may be wrapped in bandages saturated with water and then enclosed in a waterproof bag during the night. When a certain amount of low or chronic inflammatory action is going on in the ligaments and synovial membranes, small flying blisters are often useful, applied only for a short time, and with tissue-paper between them and the skin; in this particular condition, too, the internal administration of small doses of iodide of potassium is often of use. When acute inflammation occurs, as it may do when a new and severe attack of gout takes place in the seat of a chalk-stone, the amount of swelling which ensues may cause the cutis to give way, whilst the cuticle remains entire. It is better in these cases to avoid, if possible, making any incision; for the salt is deposited not simply in the cellular tissue or collected as a mass, but also in the actual substance of the articular cartilages, and cannot, therefore, be expected to be entirely or freely evacuated. Soothing applications are of most service; but it may be remarked, that where an opening occurs naturally, or is made by the surgeon, the serious consequences frequently attendant on wounds of articulations are not to be expected, partly from the disorganisation which has occurred, partly also, no doubt, from the unimportant character of the joint which is usually involved. Severe operative measures are not called for in these cases. While the inflammation runs high, poultices and fomentations are of most service; afterwards, gentle pressure may be employed, and the sinuses which are left should not be irritated by probing or by stimulant applications, but allowed gradually to contract and ultimately heal. As already stated, when ulceration has once occurred, the case is almost invariably tedious, and may be rendered more so by too active surgical treatment.

Pyæmic synovitis.—Acute synovitis, frequently leading to suppuration in the joints, is not a very uncommon consequence of purulent or systemic infection, and is met with in phlebitis, after operations, and in connection with certain puerperal conditions, as well as in the progress of fevers, &c. For the description of the general condition giving rise to this complication, its symptoms, and its treatment, the reader is referred to the essay on PYÆMIA. It need only be stated here, that when this pyæmic condition exists, there is always danger of the joints, as well as of other parts of the body, becoming the seat of the local disturbance. Sometimes the attack is marked by the occurrence of violent pain, accompanied or followed by heat, redness, and swelling, affecting one or more of the articulations, which may present distinct fluctuation, provided they are superficially situated. In these cases more or less thin and liquid pus may be found in the interior of the joint, or, in some instances, diffused throughout the external areolar tissue. In other cases, however, large deposits of pus may take place in the joint, suddenly or insidiously, unaccompanied by pain, and perhaps unsuspected during life. The number of joints affected may vary considerably. Only one may be attacked, or it may be difficult to find a single articulation which does not present pus when cut into. The inflammatory condition may remain confined to the synovial membrane, but frequently extends to the other structures, which become more or less disorganised. In a case of suppuration of the knee, following thecal abscess of the finger, Dr. Handfield Jones found increased vascularity of the synovial membrane, with villous projections from its surface; whilst the articular cartilage was ulcerated in places, the cartilage-corpuscles containing a greatly increased number of celloid masses in their interior, and the intercellular substance being fibrous, and deprived of its natural consistence.

The *treatment* in these cases is mainly directed to the relief of the constitutional infection, and its principles have been laid down in the essay on PYÆMIA. Locally, when we have reason to suppose that a joint is becoming implicated, it should be maintained in a state of perfect rest upon a splint, and the pain relieved by soothing applications. When suppuration has indubitably occurred within the joint, a free incision for the purpose of evacuating the matter is desirable, and the local treatment already recommended for abscess in the synovial membrane becomes applicable.

Gonorrhœal synovitis; *gonorrhœal rheumatism*.—A form of synovial inflammation is occasionally met with in connection with purulent inflammation of the urethra, or even with purulent ophthalmia. This complication appears to have been first described by Sir Benjamin Brodie, and usually passes now under the name of *gonorrhœal rheumatism*, though it differs in several respects from rheumatism, and is not necessarily connected with gonorrhœa. In these cases, during the existence of a urethral discharge, which may depend on gonorrhœa, or arise after the passage of a bougie, inflammation occurs in the synovial membranes of one or more of the joints, more particularly in the knee. Another peculiarity, which was pointed out by Sir Benjamin Brodie, is, that some form of ophthalmia very commonly accompanies or precedes the articular affection, or may alternate with it. All stages of gonorrhœa may present this complication, and usually no material change in the discharge is noticed, though sometimes it declines a little, when the synovial affection shows itself. The articular inflammation may last for a few weeks, or may continue for months or even years. It is very apt to involve one joint after another, and presents a decided disposition to relapse. There is little tendency to suppuration, but sometimes the synovial membrane is thickened, and the movements of the joint permanently interfered with. In some few instances the case is much more severe; the cartilages become involved, and permanent rigidity may be the result.

The immediate cause of this affection is still a matter of dispute. By some it has been considered to be connected with the gouty habit;* whilst Mr. Barwell considers it to be 'in reality a slower form than ordinary of purulent infection, produced by inflammation of the prostatic veins.'† He allows, however, that he has 'no cases of dissection to prove this position,' but the following case related by Mr. Prichard certainly seems to favour Mr. Barwell's views.

A patient in the Bristol Infirmary for gonorrhœa and orchitis, was attacked with feverish symptoms, followed by great pain and swelling in the right knee. In a few days the lower part of the thigh was filled with matter which had escaped from the distended synovial membrane. The limb was subsequently amputated, and the joint found to be completely disorganised.

Treatment.—The local treatment in these cases is much the same as that recommended in ordinary synovitis. So long as acute inflammatory symptoms are present, the usual antiphlogistic measures must be had recourse to, and if the pain is very severe, as is sometimes the case, subcutaneous injections of morphia may be employed; when effusion remains, free blistering should be employed, and 'Scott's bandage' applied in those cases where there is thickening about the joint. At a subsequent period, friction, shampooing, local vapour baths, or the use of the mineral waters of Buxton or of Wiesbaden, will probably be of service. The general treatment must also be conducted on the ordinary physiological principles. As the inflammatory excitement passes off, the iodide of potassium, combined with colchicum and opium, may be administered, along with occasional active purgatives; to be followed at a still later period by mild tonics. In the more chronic forms of the disease the greatest benefit will be derived from change of climate, including a residence at the mineral springs recommended for chronic rheumatism, with the use of the waters both internally and externally. The treatment of this affection by keeping bougies in the urethra, or by the administration of cubebs and copaiba, as once recommended, is hardly likely to be often had recourse to in the present day.

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* Johnstone, *On the Genito-Urinary Organs*, p 317.

† *On Diseases of the Joints*, p. 101.

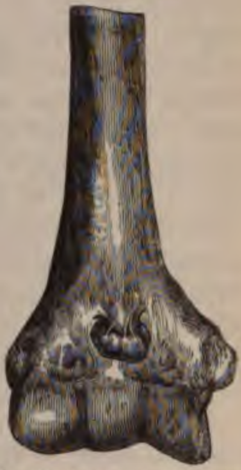
Syphilitic synovitis.—The character of the synovial inflammation in some cases is modified by the existence of constitutional syphilis. Occasionally, as Sir Benjamin Brodie remarks, the synovial membranes of one or more joints assume a sluggish form of inflammation in the early stages of secondary syphilis, in connection with papular eruptions. More frequently, perhaps, the joint-affection comes on at a more advanced stage of syphilitic infection, in connection with affections of the bones, and especially of the periosteum. The inflammation in most cases is anything but rapid in its progress or acute in its symptoms, though the nocturnal pains may be severe; and it is readily distinguished by its occurrence during the existence of other and characteristic symptoms of venereal blood-poisoning. Its constitutional origin is also marked by its tendency to affect more than one joint. The general treatment is naturally directed to the cure of the syphilitic infection. Mercury may be used in the form of fumigations, in conjunction with the vapour-bath, in many cases where it cannot safely be taken internally. The iodide of potassium, in moderate or, if need be, in very large doses (forty to sixty grains a day), combined with sarsaparilla or other medicines that tend to strengthen the patient, is often of the greatest benefit. Locally leeches are seldom required. Soothing applications may be had recourse to if the pain is severe, but rest of the limb by means of splints, and mild counter-irritation, are the remedies most frequently of service.

'Loose Cartilages' in Joints.

We occasionally find in some of the articulations small movable bodies, which may be quite free or still attached to the walls of the joint by narrow pedicles, and to which the name of 'loose cartilages' has been given. These bodies, which are usually met with in adults rather than at an earlier period of life, vary in their structure; some are comparatively soft, of a yellowish colour, and resemble masses of fibrine; in other cases, they are hard and glistening, rather white than yellow, and evidently composed of cartilage or fibro-cartilage, both on the surface and in their interior; frequently, too, they are partially, or sometimes almost completely, converted into bone. In many cases we find only one such body in a single joint, but it is by no means uncommon for two or three to be present, and occasionally they are met with in much higher numbers; Morgagni, for instance, discovered twenty-five smooth and polished globular bodies in the left knee of a woman who died of apoplexy. They vary considerably in size, being sometimes no larger than a barleycorn, whilst in other cases they may nearly equal the patella itself in their dimensions. When small, they are usually round or oval; when of considerable size, they may be elongated, flattened, or tuberous. The most common situation for these 'loose cartilages' is the knee, but they are not confined to that joint; they have also been discovered in the other articulations, including even the hip, which was long supposed to be exempt from them.*

'Loose cartilages,' in many cases, at any rate, appear to take their origin from the small irregular projections which naturally exist in connection with the 'vascular processes' of the synovial membrane. In certain abnormal conditions these processes increase in size and solidity, and may ultimately become detached from their connections, so as to form separate bodies, which are perfectly free in the joint, or they may still remain connected with the parietes by an elongated pedicle. They are composed of 'connective tissue with elongated nuclei, and coated with epithelium, and, though not always, contain a variable number of scattered fat- and true cartilage-cells; and they are not developed externally to the synovial membrane, but from an outgrowth of that membrane itself.'† Occasionally we find imperfectly formed bone in the substance of the masses, derived probably from a further stage of conversion of the cartilage, or they may

FIG. 210.



Cartilaginous growth connected by a narrow pedicle with the coronoid fossa of the humerus. (From a preparation in the Museum of St. George's Hospital. Series iii. No. 145.)

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* See *Archives générales de Médecine*, tome xii. (1846), p. 363.

† See note to Kölliker's *Manual of Human Histology*, vol. i. p. 328.

be bony throughout. According to Dr. R. Adams, these foreign bodies, which may be supposed usually to take their origin from the synovial membrane, are especially connected with the condition constituting *chronic osteo-arthritis,* though it is not denied that they are seen in articulations which present no trace of that disease. It is probable, however, that the detached bodies found in joints may have more than one origin; occasionally, perhaps, they may result from a blood-clot which has lost its colouring matter, and now consists only of fibrine; and in many instances they can be traced to an accident by which, probably, a portion of cartilage or fibro-cartilage has been detached, and which may, after a time, become smooth from long-continued friction.

In support of this view, Mr. Brodhurst [*] relates an interesting case in which, six weeks after the accident, he removed from the knee-joint a 'loose cartilage,' which proved to be the anterior portion of the internal semilunar cartilage, retaining in every respect its normal appearance.

A 'loose cartilage' may exist in the joint for a length of time without producing sufficient disturbance to attract the attention of the patient, or to make him think that he is subject to anything more serious than occasional rheumatic twinges. At last, however, in some movement of the joint, the foreign body slips between the articular ends of the bones, and then a violent and sudden pain is experienced, with inability to use the limb, which remains fixed in the position which it may have happened to assume at the time. The pain continues until the 'cartilage' is dislodged by some means, when the immediate symptoms at once subside, though they are often followed by inflammation of the synovial membrane, accompanied with effusion. The character of the suffering in these cases is peculiar, being often sufficient to make the patient fall, or even to occasion syncope, and is probably due to the sudden stretching of the ligaments caused, in the case of the knee-joint, by the tibia and femur being forcibly separated when the loose cartilage gets between their articular ends during flexion and is accidentally caught during extension, before it has time to slip aside. The attention of the surgeon is now called to the part, and, on careful examination, he may succeed in discovering a firm extraneous body in the joint, which slips beneath the finger, to be lost beneath the patella or the tendinous structures above or below that bone. When the symptoms described have once occurred, they may be repeated at varying intervals; in some cases recurring on the slightest movement, and even during sleep, whilst in others they may be kept in check so as to give rise to but little practical inconvenience. If the attacks are frequent, however, the joint suffers sooner or later; the ligaments become relaxed, disease extends to the harder tissues, and the articulation is permanently injured. Many of the symptoms produced by a 'loose cartilage,' it may be mentioned, are occasionally met with as the result of partial dislocation of a fibro-cartilage in the knee, as well as, more rarely, in the articulation of the lower jaw, constituting what Mr. Paget terms *locked joint*.* A description of this condition in the knee will be found in the essay on INJURIES OF THE LOWER EXTREMITY (vol. ii. p. 916).

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[*] *St. George's Hospital Reports,* vol. ii. p. 142.

The treatment to be adopted may be either palliative or radical. In the first place, however, any inflammation which may be present must be subdued, and any dropsical effusion got rid of by blisters or other appropriate remedies. When this has been done, a well-fitting elastic bandage or, still better, a back splint, which will prevent the joint from being flexed, should be constantly worn, whilst the loose cartilage may be fixed (by means of pads or strapping) to some part of the synovial membrane, in the hope that absorption may ultimately take place, as will sometimes happen. In many cases this treatment is sufficient; but in some inconvenience is still experienced to such an extent as to suggest further operative measures. When such is the case, the extraneous substance may be removed from the cavity of the joint, either by direct or by subcutaneous incision. Both these operations, however, are attended with a very decided amount of risk, and should only be performed when the palliative treatment has been fully tried and *failed*, and the foreign body continues to give rise to active mischief. The foreign body, too, should be clearly movable, and capable of being brought to a part of the joint in which it is easily accessible. The patient should be prepared for the operation, both by appropriate diet and regimen, and also by the limb being kept perfectly at rest for a few days. The loose cartilage is then guided to that part of the joint where it is most superficial, and fixed securely, so that it may not slip out of the way during the operation. If the *direct* operation is the one adopted, the parts over the foreign body are now divided, and a sufficient opening made in the synovial membrane to allow the cartilage to be pressed out of the wound, without any unnecessary manipulation or disturbance of the joint. The edges are then accurately brought together by sutures or strips of plaster, and the limb kept at perfect rest on a splint; constant cold may also be applied to the joint, to prevent, if possible, the occurrence of inflammatory symptoms. In the *subcutaneous* operation, the cartilage having been securely fixed as before, a tolerably long tenotomy knife is introduced through the skin, at some few lines' distance, and passed through the cellular tissue so as to make a subcutaneous incision into the joint. Great care must be taken in dividing the synovial membrane, that the foreign body does not slip aside, for which purpose it is better for the operator to secure it himself with one hand, whilst he makes the incision with the other. The loose cartilage is then pressed either *into* the aperture in the synovial membrane (as recommended by Mr. Square), or *through* it into the subcutaneous areolar tissue, and retained in either position by appropriate means in the expectation of its becoming ultimately absorbed.

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* *British Medical Journal*, January 5, 1867.

Sir Benjamin Brodie states, in his work on the joints, that his experience does not enable him to determine which of these operations (the direct, or subcutaneous), is to be preferred. According to M. Larrey, who refers to 167 published cases of removal of loose cartilages by operation, out of 131 cases in which the old or direct method was employed, 98 were successful, 5 doubtful, and 28 died; whilst of 39 indirect operations, 19 were successful, 15 failed, and 5 died. From this it would appear, as M. Larrey states, that extraction by either method is attended with decided danger; but that in the *direct* operation, the risk to life is greater than in the *subcutaneous*; while, on the other hand, in the subcutaneous operation there is increased difficulty, and consequently less chance of success. On account of the difficulty which is experienced in getting the cartilage out of the joint into the cellular tissue without an undesirable amount of manipulation, Mr. Syme recommends another method, by which, he says, he generally succeeds without risk. This consists in 'making a free subcutaneous incision through the synovial membrane and cartilage, and applying a blister over the part where it is retained.'

DISEASES OF THE ARTICULAR EXTREMITIES OF THE BONES.

The diseases of the joints which originate in the articular extremities of the bones are next in importance and in frequency to those which commence in the synovial membrane. It will not be necessary, however, to enter much into detail in treating of them here, as the morbid processes have been already described in the essay on DISEASES OF THE BONES (vol. iii.). A brief notice of these affections in their relation to the joints will therefore be sufficient.

Simple inflammation of the articular ends of the bones, and its consequences.—The articular extremities of bones are liable to attacks of simple inflammation, which may result from injury, or depend on other causes. The changes which take place resemble those which result from inflammation of other tissues, when allowance is made for physical differences of structure. In favourable cases restoration to a healthy condition occurs, or the inflammatory products may give rise to deposition of increased ossific material, leading to hardening and increased weight or size of the part. In less favourable cases suppuration takes place, which may be circumscribed, forming a *local abscess* in the articular extremity, or diffused in the cancellous tissue, as in *osteo-myelitis. Local abscess of bone* is usually found in the head of the tibia, and, as a general rule, is recognised and remedied before the articulation is affected. If not, the synovial membrane becomes inflamed from time to time; and if the original mischief is still allowed to remain, the matter may at last make its way into the joint, giving rise to suppuration in that cavity. For a detailed description of the symptoms and treatment of *local abscess in the cancellous tissue*, as well as of *osteo-myelitis* (which may in like manner lead to a discharge of pus into the nearest joint-cavity), the reader is referred to the essay above mentioned.

The inflammation may lead to the death of the whole or a part of the articular extremity, constituting *necrosis*. If the dead portion is limited in its extent and situated near the surface, the articulation may escape with little or no damage, and the sequestrum separate, or be removed by operation. Sometimes the necrosis is deep-seated, presenting then many points of resemblance with local abscess of bone, like which it may lead to destructive inflammation of the joint. In some of these cases the true state of things is only recognised when death or amputation allows the parts to be dissected; in others, however, a similar operation to that required for local abscess can be performed, the dead bone is removed, the pent-up matter evacuated, and the joint is saved. Sometimes the whole or the greater part of the head of the bone dies, giving rise, of course, to rapid destruction of the joint. As no hope can exist of saving the joint in such cases, its removal, when practicable, becomes the only course to be pursued. In early life, it should be noticed that the *epiphysis* may be separated from the shaft of the bone, and lie loose in the joint, as the result either of acute or chronic disease. In such cases removal of the detached epiphysis will probably often be sufficient, should the true state of the case be detected, which may sometimes happen, though there are no very positive symptoms to distinguish this from other forms of death of the articular extremity. In necrosis affecting the very small joints, such as those of the fingers and toes, the amount of constitutional disturbance involved is so slight that we may wait, if we think it expedient, for the natural separation of the parts. In this way a sufficiently useful thumb or great-toe may be preserved, the superficial position of the articulation facilitating the removal of the dead bone.

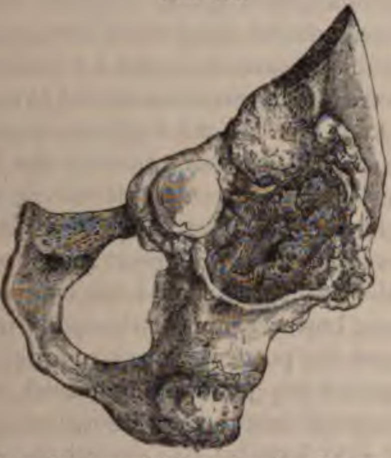
Finally, instead of death occurring in obvious masses, the inflammation may lead to a molecular destruction and removal of the osseous tissue, by a process analogous to ulceration, which is termed *caries*. Caries of bone in the vicinity of joints may arise from simple inflammation; it occurs, however, so much more commonly as the result of a low form of inflammation usually described as *scrofulous*, that it is convenient, practically, to defer its consideration, or to merge it in the description of the latter form of disease, to which we now proceed.

Scrofulous inflammation of the articular ends of the bones.— The pathological changes involved in this action, so far as the bone is concerned, are described in the essay on DISEASES OF THE BONES; they need not be recapitulated here. Suffice it to say, that we find the affected bone more vascular than natural (at least at first), then light and oily, as well as unusually soft, so as to admit of being cut with a knife, the cancelli being dilated and filled with a jelly-like substance. This form of inflammation is much disposed to lead to caries. Caries, when affecting the articular extremities of the long bones or the cuboid bones, such as those of the tarsus and carpus, commences frequently in separate points of the cancellous tissue, which gradually extend, and so approach the surface. At last the periosteum itself is reached, and implicated; it becomes detached from the osseous substance beneath, which is left rough and worm-eaten on the surface, bleeding freely, and giving exit to a foul discharge, in which are contained particles of disintegrated bone. The soft parts around share in the diseased action. Serum and lymph are effused into the neighbouring areolar tissue, giving rise to a characteristic firm and elastic swelling; at a later period suppuration occurs, and the tissues are traversed by sinuses.

When the disease is situated sufficiently near a joint, the articular cartilages in the immediate vicinity of the inflamed bone become affected; their nutrient supply, as far as the osteal vessels are concerned, is interfered with; their adhesion to the bone is impaired, and they become fibrous and ulcerate, the change commencing usually on their deeper or attached surface; or portions of them may become detached, and ultimately be found loose within the joint. The synovial membrane participates in the inflammation, which may either spread to it from the diseased cartilages, or may affect it more directly by extension from the periosteum to that part of the synovial capsule which invests the bone to a certain extent before it becomes united with the cartilage and perichondrium. It may be remarked that the affection of the articular ends of the bones sometimes assumes a peculiar form, which has received the name of '*spotted ulceration*,' but which is probably a variety of the strumous disease. When this is the case, several pits or depressions, containing a curdy matter, are found in the articular surfaces, the cartilages presenting a series of defined orifices, corresponding to the pits in the bone, their intervening structure remaining frequently unaltered. The diseased action, which has been supposed hitherto to be confined to one side of the joint, now becomes diffused; the inflamed synovial membrane goes through the series of changes which have already been described under the head of Synovitis; the articular cartilages on the opposite side of the joint become affected, they speedily ulcerate, and the cancellous structure of the bone on which they rest is exposed. The disease gives rise to the formation of matter within the joint; but suppuration, it has already been stated, takes place likewise in the contiguous soft parts. As the case progresses, the matter makes its way to the surface, it may be directly, in the immediate neighbourhood of the joint, or forming tortuous sinuses, which open at a considerable distance, and give exit to a profuse discharge. When the long bones are affected, partial or incomplete luxations are apt to take place during the later stages of the malady. The disease may continue to progress till life ceases or the joint is removed; but sometimes, after dislocation has occurred, a reparative process takes place, healthy granulations arise in the bone, the synovial membrane goes through the changes tending to recovery, which have already been described, the discharge diminishes and ceases, anchylosis takes place, and the patient is left with a limb the utility of which varies much in different cases.

Scrofulous disease of the joints, commencing in the bones, as well as in the soft structures, is frequently met with in children of strumous habit, especially in those who have never thoroughly recovered from the depressing effects of some of the ailments to which they are subject. At the Hospital for Sick Children I was able, very often, to trace the attack to the weakened state of health which had remained after scarlatina or measles. In early life the disease may affect indifferently the extremities of the long bones or the cuboidal bones; but when it commences after puberty, which is sometimes the case, it shows a decided preference for the carpal or tarsal bones. The disease is very insidious in its earlier stages, occasioning little pain or inconvenience; in children, the first thing which attracts the attention of the parent in most cases is 'limping' when the joints affected are situated in the lower extremity, or unwillingness to use the arm when the upper limb is implicated. It is now noticed too, perhaps, that the child selects that position which will throw least stress upon some particular joint, or that he flinches when that joint is moved or pressed upon; and that the nights are somewhat restless. At this time the little swelling which exists is mainly situated over one of the bones which enters into the composition of the articulation. As the disease advances, the joint itself becomes more decidedly implicated; it is rigid and more or less flexed according to the care with which it has been treated; the swelling increases, and now takes more decidedly the shape of the synovial membrane, and there is usually effusion of serum and lymph into the areolar tissue over the affected bone, distending the skin, and producing a 'white swelling.' If the case is neglected, painful startings of the limb begin to show themselves, aggravated at night-time, and causing the child to cry out in his sleep, or to wake up with a shriek of pain. When this occurs, it shows that the articular surface of the bone is affected, and beginning to be laid bare to the joint; the 'starting' becomes specially marked, too, when inflammation has extended to the opposite bone, and when, consequently, the two inflamed and sensitive osseous surfaces are subjected to mutual pressure by spasmodic contraction of the muscles. This muscular spasm is originally induced by the osteal disease; eventually, however, it reacts upon that disease, which it aggravates by the forced and violent apposition in which it maintains the inflamed surfaces. Hence the great relief to suffering so often experienced when displacement of the bones takes place, under the influence of the morbid muscular contraction, after the ligaments and other retaining structures have become weakened. When this occurs, the mutual pressure of the inflamed bone-surfaces ceases, and from this period a curative process is often dated. Before this happens, however, matter has in all probability formed in or around the joint, and sinuses are produced, taking various directions in accordance with the anatomical arrangement of the part. If a probe is introduced, carious bone can sometimes be felt, but not always, in consequence of the irregular course which

FIG. 211.



The acetabulum almost filled up with bony deposit after recovery from hip-disease, in which the head of the femur was dislocated. (From a preparation in the Museum of St. George's Hospital. Series iii. No. 90.)

the sinuses often take. The integuments around the wounds are thin and discoloured, the discharge copious, watery, and unhealthy. The general health by this time usually shows strong signs of breaking up, the child becomes emaciated, hectic manifests itself, profuse night-sweats occur, and, unless relief is afforded, some vital organ becomes implicated, leading to the death of the patient.

Prognosis.—The prospect of a successful issue to the case depends greatly on the treatment being commenced at a very early period, before the joint has become seriously implicated. It is most desirable, therefore, that any expression of pain or tenderness about a joint, or any hesitation in the manner in which it is used, should be at once attended to, and a careful examination made by a competent surgeon. In the wealthier classes this is usually done, and the progress of the case at this period can almost invariably be arrested, and a tolerably perfect cure insured. Even when the disease has arrived at a more advanced stage, when the joint has become implicated, and suppuration has taken place, care and perseverance on the part of surgeon and patient will usually be rewarded ultimately by success; for these cases occur for the most part in early life, and 'in children the plastic powers of nature are so great that recovery may take place, when in the adult any such hope can scarcely exist.'* These observations, however, apply principally to the wealthier classes; for amongst the poor, who are struggling for their daily bread, early symptoms are generally unnoticed, and the disease has advanced to a great extent before surgical aid is invoked. Even if admitted into hospital, the patient can seldom be kept there long enough for complete recovery; moreover, the general health is apt to suffer, after a time, from the necessarily impure air of a sick-ward, and so the patient returns home, to be again exposed to the imperfect nutrition, the confined air, and the want of rest as well as of necessary comforts and appliances, which originally predisposed to the disease or accelerated its progress. Sooner or later, in all probability, he again applies to the same or some other hospital, in a still more advanced stage of the malady, from which he ultimately sinks, or has to submit to operation. If the prognosis, therefore, in the affluent classes is favourable, it is far less so among the poor and needy. Where circumstances are favourable, and the treatment commenced at an early period, a few weeks may suffice for recovery with a useful and movable limb; even when portions of the cartilage have been destroyed, the functions of the joint may still be preserved, though the time required becomes considerably prolonged. When the disease has advanced to suppuration, and sinuses have formed communicating with the joint, recovery can only be expected at the expense of anchylosis, and after the lapse of many months or even some years.

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* *Lectures on the Surgery of Childhood,* by Athol Johnstone.

Treatment.—If inflammation is present, we have always to bear in mind that it is of a low character; it is to the relief, therefore, of the constitutional condition that our general treatment has to be mainly directed. Everything which improves the general health—whether in the form of diet, air, cleanliness, or medicine—must evidently increase the power of resisting disease locally, or of remedying its effects. The best means of effecting this improvement, however, have already been so fully described in previous essays, especially that on SCROFULA, that it is unnecessary to repeat them here; I need only remark that whatever form of tonic may be selected, it must be given for a great length of time to be of service. As Sir Benjamin Brodie directs, the steel may be administered for three or four weeks at a time, and then suspended for a week or ten days; or some other tonic substituted, if the first should have ceased to agree. Even after recovery has taken place, as the constitution is in fault, it is necessary to persevere with the general hygienic rules prescribed in these cases, if we wish to prevent a recurrence of the disease in the same or some other part.

The *local treatment*, when the disease is seen in its *first* stage, is to a great extent negative. The disease is one of defective power; local depletion, therefore, should be avoided, as a rule, though occasionally a few leeches may be employed to relieve rapidly any outburst of acute or sub-acute inflammation. Cold or warm applications can be used at these times, whichever may be most agreeable and soothing to the patient. Counter-irritants, whether in the form of blisters, issues, or the actual cautery, unless in exceptional cases, are seldom required *at this period*, and, indeed, are more likely to do harm than good, by exhausting the patient. They are also objectionable for another reason: these cases usually occur in children, and repeated painful applications, with the frequent dressings subsequently required, induce fits of passion or of apprehension, which are lowering to the patient and injurious to the malady. In fact, in the treatment of children, it is of great moment for the surgeon to acquire their confidence, to inspire them with a feeling of regard and affection; and this can never be done if his visit becomes frequently associated in their mind with pain and suffering. It may of course be necessary at times to have recourse to operative measures, or thorough examinations of inflamed and sensitive parts; but if practicable, these should be done *once for all*, and usually under the influence of chloroform. Is nothing, then, to be done locally? *Efficient and prolonged rest*, with the limb in a proper position, here as in scrofulous synovitis, is of the greatest moment, and absolutely necessary to prevent further mischief. The limb should be wrapped in a thick layer of cotton-wool, properly secured, pasteboard or other splints adapted to the form of the joint applied, and the whole secured by gummed or starched bandages, which, without being at all tight, should extend so far as to embrace the joints *above* and *below*, as well as the actual one which is diseased. It is necessary that the limb should be fixed to this extent in order that the contraction of those muscles which arise at some distance from the articulation may be prevented, and the joint kept *absolutely in a state of rest.* Support, to a sufficient extent, should be continued to the part for some time after apparent recovery. It is also desirable that the splints should be so adapted as to allow exercise to be taken, whilst immobility of the joint is maintained.

When the disease has been neglected or improperly treated in its first stage, it commonly happens that the limb has been allowed to become distorted, and more or less fixed in its abnormal direction. In such a case it is better at once to restore the limb to its proper position, of course under chloroform, and to adopt efficient means to prevent it from again becoming distorted. The expediency of this treatment depends not merely on the fact that anchylosis is to be expected (and for recovery by anchylosis to be desirable the limb must be fixed in a proper position), but also on account of its immediate influence on the disease. The painful startings are occasioned by pressure on the inflamed bone-surfaces; and so long as undue and irregular pressure is maintained by the muscles in a state of spasmodic contraction, pain must be experienced and irritation kept up. Dr. Bauer has proposed to divide the tendons of the contracting muscles independent of any malposition, as a means of relieving the starting pains; and such a plan might not unreasonably be adopted if all milder means of relief should prove unavailing. Supposing the disease to be situated in the lower extremity, a long splint is often employed with great advantage as far as mere rest is concerned, but with comparatively little power of relieving articular pressure. For this latter purpose Sir Benjamin Brodie suggested the application of a moderate but constant extending force, by means of a weight attached to a string, passing over a pulley fixed at the bottom of the bedstead, the other end of the string being secured to the limb, whilst counter-extension was kept up by straps, which prevented the body from slipping down in bed. Of late years extension by weight has come pretty freely into use both in America and this country, in consequence of the advantages which it presents, and the facility with which it can be applied. In Mr. Holmes' *Surgical Treatment of Children's Diseases*, and in some papers by Mr. Marsh in *St. Bartholomew's Hospital Reports*, the subject will be found fully discussed; but I may, perhaps, be allowed briefly to illustrate the plan of treatment by means of a case now under my care at the Brighton Hospital for Sick Children.

A girl about six years of age was admitted with neglected hip-joint disease in the second stage. Thigh much flexed and rigid. Knee turned inwards. Pelvis and spine much twisted. No sinuses or other indications of matter, but painful nocturnal startings and shrieks when the limb is touched. A broad strip of adhesive plaster was applied on either side of the leg from the knee downwards, forming a loop or stirrup some three or four inches below the foot; a flat piece of wood, broader than the foot, was inserted between the two lateral portions of plaster, so as to spread them out and prevent pressure on the malleoli. The plaster was further secured to the limb by two or three circular pieces of strapping, and a light bandage. A stout iron skewer was then passed through a common reel, and the skewer suspended by a couple of straps to the bar at the foot of the child's crib, so that the pulley formed by the reel was opposite the sole of the foot. A bag containing four pounds weight of lead was then fastened to one end of a small chain, the other end being free for the purpose of being fastened to the stirrup of plaster when required.* When all was ready, the child was placed under chloroform, and the pillows removed so that she lay flat on her back. On making gentle extension on the thigh, the muscles began to yield quietly, and then one end of the chain, passed over the reel, was hooked on to the stirrup, the four-pound weight hanging to the other end some distance from the floor. Straightening of the limb progressed steadily and visibly, and as this was going on, a long splint was fastened to the opposite or *sound* side of the patient, to correct the lateral twisting of the body and also to prevent any sudden jumping up in bed under the influence of fright. The hip was enveloped in cotton-wool; sand bags were placed on each side of the limb for support: the lower end of the bedstead was raised about three inches by pieces of wood in lieu of counter-extension, to obviate any chance of the body slipping down; and finally a cradle was placed over the foot to keep off the weight of the bed-clothes and prevent eversion. When the effects of the chloroform had passed off, the limb was nearly straight and the child made no particular complaint of pain, but was cheerful and took her meals. There was some 'starting' on the following night, but less than before, and next day the child was comparatively comfortable and happy.

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* Fig. 119, vol. ii. p. 869, will illustrate this apparatus.

In the second stage of joint disease, counter-irritation is more often required than in the first. The most generally beneficial form, I think, is the steady and continued use of warm applications over a large surface of skin. Iodine is often of service, and blisters occasionally, though these last had better be employed with care and caution in children. Severe pain, continuing after the limb has been properly secured and sufficient extension made, is often relieved by a few lines of the actual cautery.

In the third stage, when matter is forming, the limb must still be retained in a state of perfect rest and extension. Hot applications, or, perhaps, the actual cautery may be employed, but the pain often continues unrelieved till the matter is evacuated by incisions, or has made its own way through the ligamentous structures towards the surface.

If the case progresses favourably, and the sinuses contract and close, the treatment consists in the same local measures as those which have already been pointed out in the section on *strumous synovitis*; but the case may not progress favourably, and it may then become a question of resorting to *operation*. It has already been stated that in early life the limb may generally be preserved. With the children of the very poor, however, especially those in large towns, and, indeed at all periods of life amongst those who have to gain their livelihood by labour, this question often arises: Is the chance, or even the strong probability, of ultimate recovery with a stiffened limb, after many months, perhaps years, of confinement and forced abstinence from labour, preferable to a more immediate recovery with a loss of the limb or joint, but with all the risks attendant on a grave operation? Every case must be decided on its own particular merits; but having this consideration in view, it is evident that a surgeon is often justified in using the knife even where an operation is not absolutely necessary. When health is failing under the protracted confinement, suffering, and exhausting discharge, removal of the part often becomes advisable to *preserve life.* Now in weakly subjects, anything which lowers the patient, or effects a drain upon the system, is prone to induce disease; the removal of the source of mischief, therefore, often saves life by preventing more important structures from becoming affected. On the other hand, it must be borne in mind that operations in strumous subjects are, in some cases, rapidly followed by the appearance of tubercle in internal organs, which did not previously exist, or, at any rate, had failed to manifest itself. In deciding the point, the surgeon will undoubtedly be influenced by the position and importance of the diseased part, and the consequent severity of the operation required. To expedite the patient's recovery, he would promptly remove one or several of the tarsal bones, when he would hesitate about amputating the thigh, or excising the head of the femur.

The comparative merits of amputation and excision will be discussed hereafter. (See the essay on EXCISION.)

The articular extremities of the bones are liable to *rheumatic inflammation.* In the essay on DISEASES OF THE BONES, the subject of *rheumatic ostitis* is described; and its relation to diseases of the joints is further discussed in the sections on Chronic Rheumatic Synovitis and Chronic Osteo-Arthritis, to which the reader is referred.

The joints may also suffer from syphilitic inflammation commencing in or extending to the bones. For this also the reader is referred to the essay on DISEASES OF THE BONES; and some further remarks on the subject will be found under the head of Syphilitic Synovitis.

Rachitic affections of the articular ends of the bones.— The bones are materially affected in the constitutional derangement giving rise to rickets. This condition, which is sometimes supposed to be of modern origin, though the lines of Martial* would seem to show that it could not have been unknown in his time, is described in another part of this work.† It is only necessary to remind the reader here, that though the alterations which occur are specially manifested in the *shafts* of the bones, yet the articulations do not entirely escape. In the early stage of rickets the 'knots' or swellings which take place in the osseous or cartilaginous ends of the bones are highly characteristic of the affection. At the anterior extremities of the ribs these enlargements are particularly obvious, affecting both the bone and the cartilage, and giving rise to an angular projection of the costo-chondral articulations. At a later period these articulations become much weakened, and permanent alteration of shape occurs. Sometimes the rib projects, and the cartilage is forced inwards; more frequently it is the rib which is driven inwards, and the cartilage is dislocated on its external surface, a connection between the two being still maintained by ligamentous tissue. If the chest is examined, the extremities of the ribs will be found presenting a row of nodosities, the sides of the thorax are hollowed, the thoracic capacity diminished, and the function of respiration interfered with to a more or less serious extent. In the limbs similar nodosities are met with in the articular extremities of the bones, first appearing in the lower ends of the radius and ulna, as well as in the malleoli, and afterwards affecting the knees and elbows. As the disease advances, the shafts of the bones undergo the alterations described elsewhere, the bending of the diaphyses occurring more frequently, as well as at an earlier period, in the lower than in the upper extremities. The articulations participate more or less in the deformity, being often twisted in an opposite direction to the curvature which the limb has assumed. The ligaments yield, and incomplete dislocations are apt to take place. At the knee, for instance, displacement may occur outwards or inwards, resulting from a partial yielding of the articular extremities of the femur and tibia, itself induced by the unequal distribution of the weight of the body on the surfaces at the joint.*

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* Cum sint crura tibi, simulent quæ cornua lunæ,
In rhytio poteras, Phœbe, lavare pedes.

† See SURGERY OF CHILDHOOD.

The nature of the affection, when the joints are implicated, can scarcely fail to be recognised, in consequence of the rickety condition of other parts of the osseous system, and the period of life at which it occurs. The treatment in these cases is mainly constitutional, to remedy, if possible, the specific diathesis; cod-liver oil, probably, being the medicine which is most generally beneficial. Locally, it is advisable in most instances, when the articulations are disposed to yield and to become distorted, to apply mechanical support of such a nature as to counteract the tendency to displacement, and allow of exercise being freely taken. The articular deformity in this way is often relieved, and the results obtained are tolerably satisfactory.

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* See Bouvier, *Sur les Maladies chroniques de l'Appareil locomoteur.*

Tumours of the articular ends of the bones.—In the essay on DISEASES OF THE BONES an account of the new formations which occur in connection with the osseous system will be met with. If the articular ends are involved, the joints may evidently become affected either by their movements being mechanically interfered with, or, in the case of cancer, by extension of the disease to other structures, and consequent disorganisation of the articulation. The symptoms, therefore, produced by these formations, especially the malignant, present certain points of resemblance with those of other diseases of the joints, which may be briefly noticed. In some cases, the nature of the tumour for various reasons is obvious enough, and no difficulty arises in the diagnosis, but this is far from being generally, or even usually, the case; the rules, however, by which we are to be guided are laid down in the essay to which the reader has already been referred. The form of malignant disease most frequently met with is the soft or medullary, and according to Rokitansky it never commences, as a primary disease, within or upon the synovial membrane; the same remark applies with increased force to the cartilages, for the cartilaginous structures are sometimes found intact when every other part of the joint has been destroyed.* Whatever may be effected in the case of innocent formations, in malignant affections the only chance of relief consists in amputation, which should be performed, if possible, so as to remove the whole of the affected bone. Even when this is done, the chance of permanent success is far from great; but amputation involving the retention of any portion of the cancerous bone is next to hopeless. Obviously, therefore, it is desirable to ascertain in which of the bones the disease began; and by attending to the point where the swelling first manifested itself, this can usually be determined.

ABNORMAL CONDITIONS OF THE ARTICULAR CARTILAGES.

The articular extremities of the bones are protected by a thin layer of cartilage, one surface of which is firmly connected with the bone, whilst the other is free in the joint, except near the circumference, where it is covered by an extension of the periosteum, forming a special coat—*perichondrium*—which gradually terminates on the cartilage, without any well-defined border. It is to this perichondrium that the portion of synovial membrane which advances over the edge of the cartilage is inseparably united.

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* See Virchow, *Cell. Pathol.* Lect. xix.

The articular cartilages, when fully developed, contain neither nerves nor blood-vessels, and yet they are living tissues, though simple in their structure. Nutrition in them, as in the cornea, is not effected directly through the means of blood-vessels, but results from the conveyance of the nutrient materials from cell to cell. The cartilage-cells retain their powers of reproduction; old cells disappear and are replaced by new ones, and so a round of nutritive changes takes place adapted to serve the wants and maintain the integrity of the tissue. The nutrient materials are obtained from the blood-vessels of the synovial membrane and of the bone; in both cases there exists a free vascular supply in close proximity to the cartilage, round the circumference of which are arranged the *plicæ vasculosæ* of the synovial membranes; whilst we find in the bones, beneath the cartilaginous surface (the *articular lamella*, however, intervening), vascular convolutions, dilatations, or plexuses, specially adapted for the reception of the blood and separation of its plasma.

The functions of articular cartilage are comparatively mechanical, intended as it is by its smoothness and elasticity to diminish friction and obviate the 'jar' or shock to the bones, which would otherwise give rise to frequent fractures. Even for these purposes, however, it is necessary that a certain amount of vitality or nutritive power should exist, else the cartilage would gradually wear away in proportion to the amount of friction it has to sustain, and that we know is not the case; for if articular cartilages are somewhat thinner in the old than in the young, the change is not greater than that which is known to occur in other tissues of unquestionable vitality.

So long as the natural processes of nutrition and secretion, as well as the disturbed processes of inflammation, were attributed entirely to some mysterious action on the part of the blood-vessels, the healthy and diseased conditions of the non-vascular tissues scarcely allowed of explanation. But when we admit the nutritive power of the cell- or germ-constituents of the tissue itself, and consider the vessels as intended to bring supplies of prepared nutriment into sufficiently near relation to them, much of the difficulty vanishes. In perfectly developed articular cartilage we have permanent nucleated cells contained in their capsules and imbedded in an inter-cellular substance; and if we have no vessels in the cartilage itself, they exist in sufficiently close proximity to the tissue for the elements they contain to be within reach of the more direct agents of nutrition. Such an arrangement would be insufficient for organs in which intense action is going on; but for the passive cartilages, the blood-vessels of the bones on which they rest, and of the synovial membranes which surround their circumference, afford a sufficient supply of nutritive material for the cartilage-corpuscles to maintain the integrity of the tissue. If this supply is interfered with, if the circulation in the bone or in the synovial membrane is disturbed beyond a certain point, we can understand that the nutrition of the cartilage should be prone to suffer, and so we find this tissue very liable to be affected *secondarily* in consequence of inflammation, common or specific, occurring in the synovial membrane or in the articular extremity of the bone. Its nutrition, however, may also become abnormal, directly or primarily, from some disturbed action in its own elements, and we have disease of the cartilage, attended with great alteration of structure, where the neighbouring tissues exhibit little or no sign of disease.

Articular cartilage then is so far under the influence of the laws which regulate vital tissue as to be at once capable of maintaining its own status during health, and of undergoing changes, many of which are analogous to those termed inflammatory, in a state of disease. Thus cartilage will maintain itself in its usual condition during a long life; it may be hypertrophied or atrophied; it may degenerate, may ossify, or perish; it may also ulcerate, and probably suppurate.*

Hypertrophy.—Articular cartilages, it is said, are occasionally found to present an increase in their substance without any obvious change in their actual texture. Such a condition, however, appears to be very rare; for, as a general rule, when the cartilage is thicker than natural, the tissue is soft and spongy, with a tendency to break up into fibres, exhibiting, in fact, obvious marks of disease.

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* See Weber, *Ueber die Veränderungen der Knorpel in Gelenkkrankheiten*,—Virchow, *Archiv*, Januar 1858.

Atrophy.—Simple wasting of the tissue in cartilage occurs more certainly than simple hypertrophy. In advanced life, and especially in those joints which are subjected to the greatest amount of pressure, such as the hip, we find the cartilages gradually thinned, their structure in other respects remaining healthy. The process is, of course, a slow one, advancing gradually with age, and constituting, in fact, little more than a sign of natural decay. True atrophy, in most cases, affects the whole surface of the cartilage; but a partial thinning is met with in comparatively early life, accompanied usually with sufficiently marked traces of previous disease to distinguish it from simple wasting.

Gouty deposits in cartilage.—In old and gouty subjects we sometimes meet with a peculiar change in the articular cartilages, resulting from the deposit in their substance of urate of soda. This salt is found not merely on the surface of the cartilage, but also in the inter-cellular substance, through which it is diffused, sometimes to such an extent as almost to supersede the normal structure, which then presents the appearance of a chalky mass. The predilection exhibited by the gouty material for this tissue is further shown by the frequency with which it is deposited in the cartilage of the external ear as well as in the articular cartilages.

Fatty degeneration of cartilage.—In advanced life, in joints which have long been disused, and under other circumstances unfavourable to healthy nutrition, articular cartilages sometimes undergo a process of degeneration corresponding to the analogous affection of the cornea, which passes by the name o *arcus senilis.* In such cases we find the whole or part of the articular surface presenting a series of fibres, free at one extremity where they project into the articulation, and attached a the other to the remaining cartilaginous tissue, exhibiting indeed, somewhat the appearance of velvet. The cartilage i often thickened and pulpy, and much softer than natural, or i may appear rough and fibrous.

Ossification of cartilage.—Many cartilaginous structures have a natural tendency to ossify as age advances, and we find the costal cartilages usually, and the thyroid and cricoid cartilages occasionally, undergoing this change, which represents in them a form of degeneration or decay. The articular cartilages, on the other hand, are by no means prone to such a transformation; for, when the developmental ossification is completed, any further tendency in this direction appears, as a rule, to be permanently arrested in the cartilage which remains beyond the articular lamella. Under certain circumstances, however, articular cartilage becomes converted into bone. This change, occasionally met with in the aged, is obvious enough at times during the progress of *chronic osteo-arthritis*; for in joints suffering from that affection, the place of the entire cartilage may be occupied by a particularly dense kind of bone, in which the Haversian canals are filled with calcareous matter; or portions of the cartilage may be replaced by this ivory or porcellanous material, which remains on a level with the remaining cartilaginous structure.*

Ulceration of cartilage.—It has been already stated, in accordance with the opinion of Weber,† that articular cartilage, like the cornea, is very liable to an altered condition of nutrition, which may fairly be called inflammatory; a condition which shows itself principally in the form of ulceration. The researches of Goodsir and Redfern, followed by those of still more recent authors, have shown that the changes in ulceration arise immediately from a vital alteration occurring in the cartilaginous structure itself, and that the influence of the neighbouring blood-vessels is only indirect or secondary. When the disease is peculiarly active, almost the whole of the cartilage may disappear, a few isolated patches, which are usually reddened, alone remaining. In other cases, the cartilage is softened and abraded; or it appears as if portions of it had been scooped out, leaving smooth pits or depressions. Ulceration usually begins on the free surface of the cartilage; it may commence, however, on its attached surface, or even in its substance.

If we examine the changes as they occur on the free surface after synovitis, we notice that the colour of the cartilage is altered in spots, which either rapidly become holes, looking, to use Sir Benjamin Brodie's expression, 'as if they had been cut out with a chisel,' or the spots assume a fibrous aspect, becoming gradually excavated, so as to form pits or depressions with fringed margins. Such a condition may be found destroying the cartilage extensively, and even laying bare the bone, without the presence of any membrane. In many cases, however, and especially in scrofulous synovitis, we find a thickened or newly-formed vascular membrane extending from the diseased synovial capsule over the cartilage. Such an extension, indeed, may occur without any ulceration resulting; or even when the cartilage is affected, the excavations are not at first necessarily in connection with the membrane, for they may be found in situations to which the membrane has not extended. As the disease goes on, however, the cartilage, according to Mr. Barwell* (in his description of the changes occurring after strumous synovitis), slowly undergoes a transformation into a form of granulation, between which and the similar material growing from the synovial membrane adhesions form, resulting at last in absolute continuity. If the ulceration extends deeply, the bone beneath participates in the disorder, its vascularity is increased, and at last the cancellous tissue becomes inflamed. The articular lamella crumbles, or gives way in masses, carrying with it portions of cartilage, which may still be comparatively sound; and the granulations which spring from the exposed cancellous tissue unite with those of the synovial membrane. When the disease originates in the bones, and extends to the cartilage, the first process, according to Mr. Barwell, is one of simple degeneration, followed usually by true inflammatory ulceration. A portion of the cartilage, losing its nutrient supply, degenerates or perishes, and is detached with its articular lamella from the inflamed

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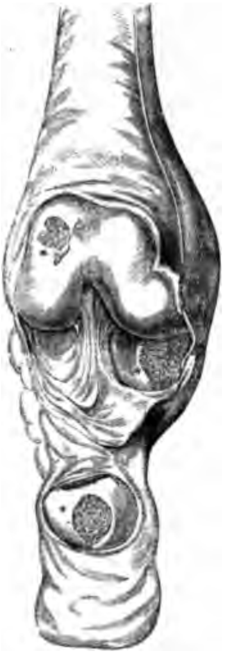
* See the section on Chronic Rheumatic Synovitis and Arthritis.

† See Weber's paper in Virchow's *Archiv* for January 1858.

FIG. 212.



Incipient ulceration of cartilage. (Museum of St. George's Hospital.)

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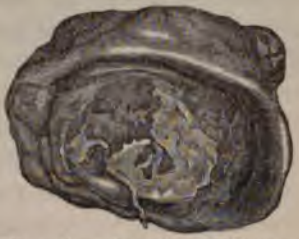
* Barwell, *On Diseases of the Joints*, p. 113.

surface of the bone, whilst the surrounding portions of cartilage undergo the changes described as occurring in ulceration after synovitis. Inflammatory ulceration of the cartilages, unaccompanied with disease of any other joint-tissue, may *possibly* take place, though cases of it are not easily met with; degeneration, on the other hand, being of comparatively frequent occurrence.

FIG. 213.



Ulceration of cartilage. (From a preparation in the Museum of St. George's Hospital.)

When the cartilages have been extensively destroyed and the cancellous bone-tissue on each side of the joint exposed, repair, if it occurs, takes place by granulation-tissue uniting the opposing surfaces, and producing anchylosis in the manner already described. Or the anchylosis may be incomplete, portions of cartilage still remaining unaltered. In slighter cases, a natural cure may occur after ulceration has gone on for some time, and affected the cartilage to a considerable depth. This takes place, as Dr. Redfern points out, 'by the formation of a fibro-nucleated membrane from the substance of the cartilage, without the occurrence of any new exudation.' Occasionally we find a patch of ivory deposit occupying the place of some portion of the cartilage, or there may be simply a scar left, marking the place where the ulcer had existed. To complete the sketch of the changes which this tissue undergoes, it may be stated that, in cartilage malignant affections are so rare that it is usually assumed to be altogether insusceptible of them.* For this insusceptibility Virchow gives reasons, founded on his views of the transference of the infection, by means of morbid juices, to the anastomosing elements in the neighbourhood.

Symptoms.—Lesions of cartilage may occur primarily or secondarily. As primary affections, we frequently find after death well-marked 'ulceration' where no symptoms had been noticed during life, excepting perhaps, occasionally, a certain amount of 'crackling' or 'grating' in the joints. These cases are of course chronic in their character, and the affection is of the nature which has been described under the head of degeneration. True 'inflammatory' ulceration is almost invariably secondary, the consequence of inflammation, common or specific,

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[*] See Chance's edition of Virchow's *Cellular Pathology*.

occurring originally in the synovial membrane or in the bone. This affection may be acute or chronic in its progress. Sir W. Lawrence * relates the case of a patient who died after venesection, in whom, as he believed, complete destruction of the articular cartilages of the femur and tibia took place in four days. In most cases, however, it is much slower in its progress; and in some, especially in old diseases of rheumatic origin, it may be extremely chronic in its character.

Degenerative ulceration of cartilage is attended with no marked symptom, gives rise to no pain. Is pain produced by 'inflammatory' ulceration? The deservedly great authority of Sir Benjamin Brodie for a long time connected with ulceration of the cartilages those severe pains which are increased at night-time, aggravated by any motion, and attended with involuntary startings of the limb. The fact, however, that no nerves can be discovered in articular cartilage, even with our present improved powers of investigation, renders such a view almost inadmissible, unless we conclude that our means of investigation are still too defective to warrant our placing trust in them. In his last edition, however, Sir Benjamin Brodie avows that he is 'inclined to the opinion that the increased sensibility in these cases is in the bony plate beneath the cartilage, rather than in the cartilage itself; and that the presence of severe pains, with involuntary startings of the limb, is always to be regarded as a sign of the bone partaking of the disease.' We may assume then, that disease of articular cartilages is attended with no distinctive or characteristic symptoms (if we except the 'crackling' on motion, mechanically attendant upon a loss of smoothness of their surface). In cases of disease commencing in the synovial membrane when starting pains come on, it may be taken indeed as evidence, not merely that the cartilages are affected, but that the disease has further extended to the bone. When the disease, on the other hand, has commenced in the bone and involved the cartilages, the joint may speedily become opened; and the suppuration and abscess which occur there are attended with the symptoms which have already been pointed out. The treatment, as well as the diagnosis of diseases of articular cartilage, so far as they can be ascertained, will be found in the description of the affections of the other structures of the joints.

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* 'Lectures on Surgery,' *Lancet*, 1829-30.

DISEASES OF OTHER TISSUES IN AND AROUND THE JOINTS.

We have seen that the diseases of the joints, which I have attempted to describe, are prone to affect in their progress the soft structures in the neighbourhood. The ligaments become relaxed and weakened; the muscles contracted; the areolar tissue forms the seat of abscess, or is traversed by sinuses; and the skin itself may be ulcerated or destroyed. The morbid action, on the other hand, may *originate* in the peri-articular structures, and either simulate disease of the joint or lead directly to it. The variety of these lesions is so great that it is impossible, within the limits of this essay, to attempt a detailed examination of them, and this indeed would be unnecessary, as their description will be found in other parts of the work. A few remarks, however, upon the relation of each of these structures to the pathology or diagnosis of joint-disease may not, perhaps, be considered out of place.

Diseases affecting the Ligamentous Structures.

The ligaments and fibrous structures around the joints are no doubt liable to inflammation, acute or chronic, in consequence of the injuries which they sustain from sprains or other accidents (see the essays on injuries of the different regions). Slow to inflame, the reparative process appears to be slow also; for it frequently happens that the movements of a joint are hampered, and its use attended with great pain for a long time, after a comparatively slight injury, in which the ligamentous or tendinous tissues alone have apparently been injured. Opportunities of examining the parts in these chronic cases have not often been afforded, or have not, at least, been often made use of; but occasionally the ligaments have been found thickened and pulpy, independent of any actual laceration of their substance. From the frequency with which chronic or 'strumous' joint-disease can be traced to some slight accident or injury, it is very probable that, in some cases at all events, the ligamentous structures are the textures originally affected, and Mr. William Adams is even of opinion 'that strumous disease commences most frequently in some of the ligaments of the joints.' At any rate in the case of the hip, the ligamentum teres and other parts of the ligamentous apparatus are found so often affected, and at so early a period, that there is much reason to believe that the disease may in many instances originate in these structures.

In the sketch of the advanced stages of articular disease we have seen the ligaments ulcerating or yielding, and so permitting the exit of matter from the interior of the synovial membrane, or allowing complete or partial luxations to occur. Sometimes, on the contrary, we find layers of a fibrous tissue, having somewhat of a lardaceous appearance and occasionally attaining a very considerable thickness, developed in the ligaments or in the areolar tissue around them, and forming the immediate cause of what is termed extra-capsular false anchylosis. In rheumatic and syphilitic affections, it is probable that the ligamentous structures share in, or even originate, the diseased action, and at least contribute to the pain which is so severely felt. In gout they may form the seat in which the urate of soda is deposited. In chronic rheumatic arthritis they suffer to a great extent; the capsular ligaments may be greatly increased in thickness, or portions of bone may be developed in their substance; and in the hip the round ligament may entirely disappear, or in the shoulder no trace of the glenoid ligament be left.

The ligaments, it was said, are liable to become relaxed in the progress of articular disease; a similar looseness of them is sometimes found as a primary affection, or at least dependent only upon some constitutional condition. In persons of lax fibres, especially in delicate or hysterical young women, a preternatural mobility of the joints is not uncommon, so that extension of the fingers or thumb may be carried nearly as far as flexion, and the nails and the back of the hands be made to meet. In many cases this state is not attended with any practical inconvenience; and even where partial luxations occur, the bones return at once to their normal position. Occasionally, however, it happens, perhaps in those persons in whom the undue mobility of the joints is not attended with a corresponding relaxed condition of the muscles, that complete dislocation takes place, which may not be reduced spontaneously, but may require surgical assistance. Instances of this kind, involving an unusual liability to luxation, are frequently recorded. A similar condition of relaxation of the ligaments, involving loss of power of the articulation, and leading occasionally to luxation, may follow palsy of a limb, and is often met with as a result of infantile paralysis. In many children it is necessary to have recourse to mechanical contrivances to obviate this weakness, whilst means are being adopted to increase the muscular power by which the joint may be moved or the limb exercised. The symptoms, progress, and treatment of articular disease, as it implicates the ligaments, will be found included in the preceding sections.

Diseases affecting the Muscles.

The altered conditions of the muscles and their tendons by which the joints are forced into certain positions, or retained in the positions they have assumed, may be primary or secondary in their relation to the articulation. In the latter case disease commences in the joint, and the muscles are affected subsequently, contracting spasmodically from reflex irritation, so as to aggravate the symptoms and give rise to increased mischief by the inter-articular pressure they produce, as well as by the tendency to partial or complete luxation caused by the predominance of one group of muscles over its antagonists; at a later stage, too, they become fixed and rigid, so as to impede functional exercise of the joint even when the original articular affection is subdued. Hence the importance, which has already been insisted on, of early attention to the position of the limb, and the necessity of counteracting the reflex muscular action by appropriate splints or by properly applied extension. The muscular lesion, on the other hand, may be primary, as far at least as the joint is concerned; from some disturbance in the nervous system, an undue or unbalanced contraction of certain muscles occurs, and the articulation is fixed in a particular position, which becomes permanent if the muscular structure degenerates and loses its proper contractile material. Such a condition of spastic rigidity is sometimes found in the adult, the result usually of serious disease affecting the cerebro-spinal axis. It is much more common in early life, as a consequence of the infantile paralysis which, if seldom fatal, is frequently quite incurable. In many of these cases the amount of deformity which occurs is deplorable, and the malposition of the joint, so long as it lasts, obviates any hope of stimulating muscles to contract, or prevents that exercise of the limb on which any prospect of improvement depends.

Rigidity of the muscles, terminating, perhaps, in atrophy or degeneration, is often seen when a limb has been maintained for too long a time in one position, and especially when pressure has also been exercised on the muscles and their tendons, and their action arrested by the application of tight bandages. This condition of the muscles may also be accompanied by grave mischief within the joint. After fractures requiring prolonged immobility of the limb, or at least in which the limb has been kept fixed for a length of time, rigidity of the parts takes place to a greater or less extent, and is very obstinate in its duration. In some of these cases, and especially when the patient is advanced in life, or the constitution is otherwise predisposed to such alterations, we may find, as M. Tessier has pointed out, effusion of serum, mixed perhaps with blood, into the joint, the synovial membrane at the same time being injected and its vascular fringes swollen. In other cases the mischief may have advanced still farther, and the articular cartilages have materially suffered, becoming reddened from contact with the effused blood, and softened in their structure, or presenting actual loss of substance on their surface. These changes, it may be remarked, are not confined to the articulation in the immediate neighbourhood of the fracture, but extend to others which have been maintained in a similar state of fixedness. The importance of due action of the muscles need scarcely, therefore, be insisted on, or the propriety of having recourse to passive motion at the earliest period of which the case will admit.

Finally, it may be noticed that an articulation is sometimes found to be perfectly rigid, from muscular contraction, in that condition of the nervous system which we term hysterical (see Articular Neuralgia). By examining the limb, however, during natural sleep, or in the insensibility produced by chloroform, the relaxed condition into which the muscles fall, and the free movements which can be impressed upon the joint, leave no doubt as to the true nature of the case.

The subject of undue or impaired muscular contraction, and its results, will be found treated in the essay on ORTHOPÆDIC SURGERY (vol. iii.); but it plays so important a part in articular disease, that it was impossible to avoid all notice of it in this place.

Diseases affecting the Areolar and Adipose Tissues.

The areolar tissue around the articular extremities of the bones, or over the synovial membranes, commonly participates in the diseases of these structures, and is either simply œdematous, or, in severe cases, becomes the seat of abscess or permeated by sinuses. Acute inflammation, on the other hand, not unfrequently attacks the areolar tissue in the neighbourhood of joints, as the result of blows or contusions, of wounds, or of erysipelas. It occurs, too, in many cases as a secondary consequence of inflammation of the synovial bursæ. The inflammatory action frequently runs high, and there is much constitutional as well as local disturbance. The swelling is considerable, the part is hot and tender, the skin reddened, and any movement of the part, including the articulation, is attended with pain. There is usually much tendency to suppurate, and when the synovial bursæ are implicated, matter forms rapidly and in considerable quantity, presenting some resemblance to acute abscess of the articular cavity. The diagnosis, however, between this affection and disease originating within the joint, is not difficult. The rapidity with which the symptoms have come on distinguish it from disease of the bones; whilst the position of the swelling, which extends over and conceals the osseous prominences, prevents it from being confounded with synovitis. By careful manipulation, too, it will be found that the joint itself may be handled without producing pain, provided that no pressure or tension is exercised upon the inflamed parts around. This kind of inflammation is not uncommon in delicate or strumous children, in whom it is very apt to involve the articulation, unless great care is taken. The knee and the shoulder are the two situations, perhaps, in which the affection is most frequently seen.

The treatment in these cases is sufficiently obvious. The limb must be kept at perfect rest; poultices and fomentations applied; and if matter forms, early and free incisions should be made for the purpose of evacuating it, lest the pus should find its way into the synovial cavity, and the case become one of serious consequence, resolving itself, in fact, into acute suppuration of a joint. The incisions, though free, should not, of course, be so deep as to open the articulation, under the mistaken idea that this is already implicated. In strumous children the general health has to be sedulously attended to, and care taken not to depress the constitutional powers.

With respect to the affections of the adipose tissue, there is little to be said; according to Rokitansky, a branching growth of fatty tissue is occasionally met with, chiefly in the knee-joint, in the free part or in the duplicatures of the synovial membrane corresponding to the lipoma arborescens of J. Müller.

Diseases of the Synovial Bursæ.

A description of the pathological affections to which the synovial bursæ are liable will be found in the essay on AFFECTIONS OF THE MUSCULAR SYSTEM, to which the reader is referred. The situation of the subcutaneous bursæ, at least of those which are most liable to disease, is well known, and they are at once so accessible to examination, and the symptoms attendant on their morbid conditions so characteristic, that mistakes concerning them are hardly likely to arise. In the case of the deep-seated bursæ, however, this is by no means so certain. Their diseases simulate to a much greater extent disease of the neighbouring joints, and, indeed, frequently lead directly to it; for in many instances these bursæ are continuous, or have some connection with the articular synovial membranes, so that direct extension of inflammation may occur from one to the other. In the description, therefore, of the special characters which attach to the diseases of the individual joints, I shall have occasion again to refer to the deep-seated bursæ, and to the means of distinguishing their affections from those of the articulations.

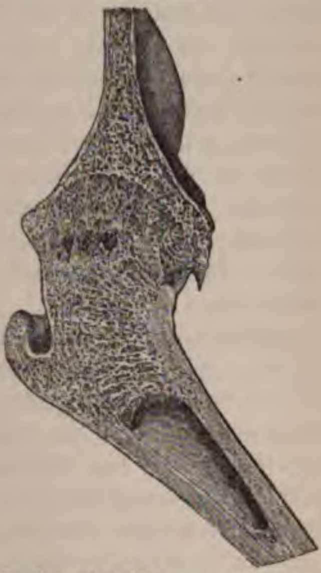
Altered Conditions of the Integuments around the Joints.

The diarthrodial joints are intended to allow of free movements of the bones which enter into their composition. If these movements are interfered with, the joint is truly affected, whether the seat of the obstruction is in one of the proper articular structures, or has only an indirect connection with them. Whenever the integuments have been extensively destroyed around a joint, the resulting cicatrix, and the accompanying induration of the subcutaneous areolar tissue, may cause the articulation to be partially or almost wholly rigid. The cases in which this usually occurs are those resulting from extensive burns; and here too we often find a limb rendered useless, and hideous deformity produced, by the original extent of the injury, or by the want of proper forethought during the healing process. In the essays on BURNS and on PLASTIC SURGERY, the importance of considering the position to be chosen for the limb, when the burn has invaded the circumference of an articulation, has been pointed out, as well as the best means to be adopted for preventing injurious contraction at the time, or for remedying it if it has unfortunately occurred. I have thought it right, however, not entirely to omit in this essay any allusion to the fact that a natural condition of the surrounding integuments is of importance to the integrity of the joint.

ANCHYLOSIS.

A want of precision occasionally attaches to the sense in which the term anchylosis is used. Originally, as the word itself implies, it was applied solely to joints which had become fixed in an *angular* or bent position; rigidity when the limb was straight receiving another designation (*ὀρθόκωλον*). The position which the limb has assumed is no longer specially designated, but we speak at the present day, somewhat clumsily it is true, of anchylosis as being *true* or *false*; the latter, at any rate, having a somewhat vague signification in the minds of many authors. By *true anchylosis* (*synostosis*) is meant actual osseous union of the contiguous bones. This implies, in most cases, destruction of the entire joint, and constitutes a further or final stage of the process of junction by fibrous tissue, which has been described in previous sections, and which forms one variety of false anchylosis. A form of osseous anchylosis, moreover, is sometimes met with in which the new bone is placed *outside* the articulation. This variety is most common in the spine, which occasionally presents superficial bridge-like bony processes extending from one vertebra to another, or even forming a kind of osseous sheath enclosing several vertebræ.

FIG .214.



Section of a hip, presenting complete bony anchylosis of the ilium and femur. (From a preparation in the Museum of St. George's Hospital.)

False anchylosis may be *intra-capsular*, when it signifies a junction of the articular surfaces of the contiguous bones by a comparatively soft or membranous tissue (the joint-cavity being partially or completely destroyed), or it may be *extra-capsular*, the union of the bones in this case depending on adhesions around the articulation, with thickening and induration of the capsular or ligamentous tissues in that situation. The latter, or extra-capsular false anchylosis, usually accompanies the former; but it may exist alone, as was seen in a case related by M. Bonnet, where the articulation was completely fixed even when section of all the muscles around had been performed after death, whilst the interior of the joint was found to be perfectly healthy, the anchylosis resulting from the presence of an enormous mass of fibrous tissue in the ham uniting the femur to the tibia.* Impaired mobility of the joints may result, no doubt, from other causes. In chronic osteo-arthritis, for instance, the shape of the articular surfaces is altered, or bony vegetations are formed around them, which mechanically impede or arrest motion. The joint may be crippled by the contraction of cicatrices after injuries or diseases affecting the integuments and contiguous tissues. Muscular retraction, too (so often present in and complicating anchylosis), may alone interfere with freedom of movement. These cases, however, may be termed 'articular rigidity,' rather than anchylosis.

Anchylosis is occasionally seen in advanced life affecting some of the minor joints without the existence of much obvious cause to account for its presence. As a rule, however, anchylosis, whether true or false, results from inflammation, common or specific, which has affected a joint, and produced a certain amount of destruction of the parts, followed subsequently by reparative action. In the majority of joints there is little difficulty in determining the fact that motion is at least impaired, if not altogether lost. In the hip and shoulder, however, it is necessary to be careful that increased mobility of the pelvis (especially noticed in children) or of the scapula is not mistaken for action of the articulation. The determination of the exact cause of the rigidity is not always easy. In chronic osteo-arthritis, irregular osseous processes may, perhaps, be felt, and the character of the deformity will assist in the diagnosis. When retraction of the muscles is the sole or principal cause of the impaired mobility, the tendons may be felt rigid beneath the skin. If the areolar tissue around the entire joint or at one part of it is indurated, inextensible, and traversed by sinuses, we may suspect that the extra-capsular form of false anchylosis is not entirely absent. If some degree of motion, however slight, can be given to the joint, we *know* that true or osseous anchylosis is not present; although the converse of this is not equally certain, for in false anchylosis the firmness of union may be so great as to render it difficult to detect any motion, even when muscular opposition is removed by means of chloroform.

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* Bonnet, *Sur les Maladies des Articulations*, tome i. p. 130.

Treatment.—It has been already explained that a time may come in the progress of articular disease when it is necessary to exercise the joint; when passive motion must be had recourse to, and friction in its varied forms assiduously employed. These measures constitute what may be termed the preventive treatment of anchylosis. Supposing that they have not been adopted, or have been inadmissible, and anchylosis has actually taken place, the treatment will depend greatly on the position in which the limb has become, or is becoming, rigid. If the position is suitable, in true anchylosis (synostosis), so slight an amount of further improvement can be hoped for, that no interference will probably be attempted. In false or fibrous anchylosis, on the other hand, if the case is seen at a sufficiently early period, the general plan of what was termed preventive treatment may usually be employed with safety to prevent soft union from becoming osseous, and also to increase such mobility as may be present, by stretching the soft uniting structures, and so adding to the usefulness of the limb.

Unfortunately it too often happens, from ignorance or carelessness on the part of the patient or his friends, possibly even in a very few cases, from remissness on the part of the surgeon in not sufficiently guarding against malposition in joint-disease, or from his hesitating to correct it at its commencement, when simply dependent on muscular spasm, that the joint may have become anchylosed in the original sense of the word, or at least in a *faulty* position, for the same position is not of equal use in all articulations, or even in all classes of persons; in certain trades, for instance, a special position is often desirable. Early treatment, then, is necessary, if the limb is to be rendered serviceable instead of becoming simply an incumbrance. Supposing the case to be one of false anchylosis, the first thing to be done is, to place the limb in that position in which it may be employed to the greatest advantage, and subsequently, when inflammation has subsided, to increase the mobility of the joint, if any increase is considered possible. The means at our disposal for the purpose of relieving the deformity have been augmented by modern discoveries: by the employment of chloroform we annihilate pain, and get rid of the active muscular contraction which would greatly impede our efforts; and by means of subcutaneous surgery we are furnished with a safe and ready method of overcoming the passive or permanently rigid state into which some of the muscles are likely to have fallen; a state which adds materially to the resistance offered by the joint.

The replacement may be immediate or gradual. In a large number of cases, where the required amount of alteration is not very considerable, the immediate process is preferable, the chance of mischief arising in consequence of the sudden change from a position which may have lasted for a length of time, not being very great if the operation is properly performed, and the after-treatment careful and judicious. In many instances, however, the restoration of shape can be better effected gradually or painlessly by simple mechanical contrivances carefully adapted to the individual joint, and in such cases this plan of treatment may properly be adopted. (See the essay on ORTHOPÆDIC SURGERY.) If immediate reduction is determined on, it is desirable that the surgeon should have a clear notion of what he is about to do; that he should have determined the position to be chosen, and calculated the obstacles to be overcome. The key to success in the process of immediate replacement consists in the previous manipulation. When the patient is placed under chloroform, therefore, the movements for the purpose of breaking down the adhesions which have formed should be properly adapted to fulfil their purpose. Instead of applying the force employed simply in one direction, by attempting *at once* to straighten the limb, the first process is to move the joint in every sense so as to render it as supple as possible. Accordingly the limb is to be alternately flexed and extended (or, it may be, abducted and adducted likewise) steadily and gradually with somewhat increasing force, till as much as possible of the natural extent of motion is obtained. When the adhesions are sufficiently broken down, the limb may then be placed, by appropriate traction and pressure, in a proper position, and secured on a splint.

Many cases of anchylosis, it was stated, are complicated by the existence of muscular retraction, which prevents the necessary movements for the relief of the anchylosis. If the existence of this retraction is evident, the muscles may be divided subcutaneously a few days before the main operation. It may happen, however, that a retracted condition of one or more muscles only becomes evident during the manipulation under chloroform. One of two courses may then be adopted. Having restored as much motion as possible to the joint, tenotomy may be practised on the opposing muscles, and the remainder of the operation suspended till the wounds have entirely healed. Or, as M. Bonnet recommends, after subcutaneous section has been practised, the movements may be persevered in till restoration of the articular functions is effected to the greatest practicable extent. If the latter plan is adopted, a very long but fine tenotomy-knife should be employed, and the integuments punctured at a considerable distance from the point of section of the muscle, to avoid if possible the risk attendant on the admission of air to the cut surface during the movements which are being performed.

As the effects of chloroform pass off, the pain which is experienced may be expected to be severe for some hours, but speedily subsides, without the development, usually, of any very severe inflammatory symptoms. Constant irrigation of the joint may be practised for the first day or two in the manner described in a preceding section, the limb being effectually secured on an open splint (the plan I usually adopted at the Hospital for Sick Children); or the whole limb may be wrapped in cotton wool, and the bandage at once starched, as recommended by Bonnet. When the proper direction has been restored to the anchylosed limb, and any inflammatory symptoms produced by the force employed have subsided, it is time, if the case is one which allows of any hope of success, to adopt such measures as may tend to develop renewed mobility of the joints. For this purpose, baths and friction may be employed, and steady and judicious passive motion had recourse to, which may be performed by the hand (usually sufficient in the child); or still better, in the adult, by various mechanical contrivances, which could hardly be understood from any verbal description.

In estimating the chances of success from these proceedings, the age of the patient and the duration of the lesion are mainly to be considered. In youth, and especially in childhood, at an age, that is, under sixteen, assuming the constitutional condition to be good, the results are usually favourable. In middle life, there is still a fair hope of success, or at least of much improvement. Beyond this period, however, and as advanced age is attained, the chances are much diminished; and if the lesion is of old standing, if the adhesions have acquired great solidity, or if the anchylosis is complicated with other local mischief, not much hope of benefit can fairly be entertained.

When the anchylosis is *osseous*, the means already spoken of are obviously inapplicable. Supposing the position in which the anchylosis has occurred to be inconvenient, it has been proposed by Mr. Barton of Philadelphia to remove a wedge-shaped portion of bone from the projecting surface of the angle formed by the limb; the extent of the broad part of the wedge varying, of course, with the amount of the deformity. When this osseous wedge has been removed, either from the anchylosed part itself, or a little above or below this point, as may be considered expedient, the remaining thickness of the bone is fractured, and the two surfaces brought together so as to redress the angular deformity previously existing.*

Finally, cases of anchylosis are sometimes met with in which the limb is not merely useless, but an incumbrance, whilst the continuance of disease in the bones, or the existence of other complications affecting the surrounding structures, prevents replacement from being effected. It may then become expedient to remove the diseased joint, or even the entire limb. The propriety of such operations must obviously depend upon the merits or peculiarities of each individual case.

ARTICULAR NEURALGIA.

We frequently meet with cases where pains are experienced in the joints without any appreciable material lesion to account for them. In many instances these are termed, and no doubt correctly, rheumatic or gouty pains, for these two conditions may have manifested themselves unquestionably in other articulations, or may ultimately appear in those which have been the seat of the erratic suffering. Occasionally pain gives a brief warning of mischief about to be developed, which it precedes only by a short time. In the pyæmic condition, for instance, a sharp pain may be felt in some joint, and though no other sign of diseased action is present, we are led to expect the formation of matter in this situation, and the progress of events commonly justifies our apprehensions.

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* See also the essay on ORTHOPÆDIC SURGERY, vol. iii. p. 722, for an account of a less severe form of operation recently introduced by Professor Gross.

The pain may have a local origin, independent of any disturbance in the joint in which it is experienced. The pressure of a tumour on some nervous trunk may give rise to suffering referred to its articular branches; and all surgeons are familiar with the fact, that pain in the knee is one symptom of disease within the hip, and yet this sympathetic affection may so mask the original disease, that I have frequently had children with diseased hip brought to me, in whom blisters or other local remedies had been applied to the knee, under the idea that *it* was the seat of mischief.

Unquestionably, however, the majority of these cases are dependent on that abnormal condition of the nervous functions which is termed hysterical. The condition, indeed, is not absolutely confined to the female sex, as the original signification of the term would imply (*ὑστέρα*, womb), for it may occasionally be met with in males, though far less frequently than in the other sex. When this morbid condition of the nervous system prevails, a local direction is often given to the perverted sensibility, by some accidental concentration of the '*attention*' on the part. The physiological effects of undue 'attention' on organs are of great interest, and serve to explain many curious phenomena exhibited in certain disturbed conditions of the nerve-centres, which may be induced artificially, as in hypnotism, or arise from less obvious internal causes, as in hypochondriasis. I am unable in this essay to devote more space to this subject, but must confine myself to a simple notice of the effects which may be produced by involuntary or automatic 'attention.' A woman is brought into close relation with some one suffering from cancer of the breast; the attention is directed involuntarily to the corresponding organ in herself; the part becomes painful, swelling even occurs, and what is termed neuralgia of the breast is set up. A case is related of a gentleman who lost an intimate friend from cancer of the œsophagus: the sufferings which he witnessed made a strong impression upon his mind; he began himself to experience difficulty of swallowing, and ultimately died from the effects of spasmodic dysphagia.

In hysteria, when the attention has been fixed on an articulation from mental or from emotional causes, or in consequence of some slight injury, symptoms which might be supposed to indicate structural disease of the joint are apt to show themselves. There is great *pain*; pain out of proportion to the other symptoms, and frequently extending over a large surface, but often suspended if the attention is diverted, and completely absent during sleep, which may be prolonged and sound. The *tenderness* is also exaggerated, and usually greater in the integuments than in the deeper structures; it is little felt, too, on firm pressure on the articular surfaces effected from a distance. There is sometimes a slight amount of *swelling*, which is diffused in the external areolar tissue, and arises from a turgid condition of the small vessels, or from increased effusion into the areolar interspaces. On handling the part, *fine crepitation* is often felt, evidently situated near the surface, and differing essentially from the grating or crackling which may be attendant on removal of the cartilages. Frequently *convulsive* or *spasmodic action of the muscles* is induced by any attempt to bend or straighten the joint; or sometimes there is a more permanent *rigidity*, by which the limb is fixed in some improper position. When volition is suspended, however, the rigidity and the spasm are suspended likewise. General symptoms indicating hysteria are often present; in many cases there is habitual coldness of the extremities, with other evidence of weak circulation; but articular neuralgia is sometimes seen in stout and florid girls. Some irregularity of the menstrual functions is usually present.

The diagnosis in these cases is generally not difficult, for it is commonly easy to detect symptoms which unequivocally vary from those which would be induced by true structural disease. It may be mentioned, however, that in old cases the patient may have acquired so much information regarding the symptoms which ought to be present, that less chance is afforded to the surgeon of detecting any palpable inconsistency. Where any doubt exists as to the true character of the affection, time should be taken before a positive opinion is pronounced; a careful examination, too, should be made, to detect and remove any local cause of nervous irritation; for these sympathetic pains may be maintained by disturbance of parts with which there is indirect nervous communication, and relief of the one will be followed by cessation of the other.

The general principles of the treatment have been laid down in the essay on HYSTERIA. In most cases tonics and antispasmodics are beneficial. Great attention should be paid to the due action of the skin and liver; and where a tendency to periodicity is present, quinine is of marked service. Change of air and occupation are beneficial, especially residence at the sea-side, where salt-water bathing, general or local, can be easily enjoyed. The patient should be urged and encouraged to use the articulation. If the limb is contracted, and any attempt at restoring the joint to its natural position is strongly resisted, chloroform may be had recourse to, and the part maintained afterwards for a *short* time on a splint, with advantage; but exercise of the joint should speedily be enforced. The moral treatment to be adopted is of material importance. The attention of the patient must especially be directed elsewhere, every effort should be made to cultivate the power of 'self-control,' and healthy occupation given, if possible, to the mental as well as to the bodily functions. A judicious mixture of firmness with kindness must also be exhibited both by friends and surgeon, and the confidence of the patient acquired, which can never be done if any form of deception is had recourse to, as has sometimes been recommended.

INJURIES OF THE JOINTS.

Wounds of Joints.

The joints are liable to various and severe injuries. The ligaments and other soft parts in the neighbourhood may be strained or otherwise damaged; the bones may be suddenly forced apart, and their natural relation to each other altered; or a fracture may extend into and implicate an articulation. These injuries, however, have already been described, generally, under the heads of DISLOCATION and FRACTURE, or, as they affect the individual joints, in the essays which treat of injuries in the different regions. The subject of *wounds of the articulations* is the only one that remains, therefore, to be noticed in this place.

In treating of wounds of the joints, I shall confine myself to those in which the synovial membrane is actually penetrated, indicated by the presence in the blood of thin lines or streams of semi-transparent glairy synovia. The wounds may be punctured, incised, or contused. The gravity of a *punctured* wound is influenced to a certain extent by the course which it takes, as well as by the nature of the instrument with which it is inflicted. When oblique in its direction, of narrow dimensions, and made with a sharp clean weapon, it corresponds to the wounds produced in subcutaneous surgery, and has comparatively little tendency to give rise to suppuration; a direct wound, on the other hand, even of the same size, is more prone to produce serious mischief, especially if it is made with a blunt or jagged instrument. To a certain extent, the same observations apply to *incised* wounds, but their greater dimensions much increase the chance of the admission of air, and of the supervention of destructive inflammation, whatever the direction they have taken. *Contused* wounds of a joint may be inflicted from within or from without. The former have been described under the head of Compound Dislocation; the latter are produced by heavy or blunt instruments, and are formidable from the injury of the soft parts they involve, and the consequent chance of mortification, as well as from the inflammation they may be expected to induce.

Under favourable circumstances, the edges of an incised or punctured wound, if maintained in perfect apposition, may unite speedily by the processes described in the essay on WOUNDS, and the articulation be restored to a sound and healthy condition. When the wound is much contused, the edges gaping, or when other circumstances are not favourable, severe inflammation takes place, suppuration rapidly ensues, and destruction of the joint may be expected to occur. The mischief may not even be confined to the articulation; pyæmia may be established; or the patient may sink, exhausted by the profuse discharge, and the fever excited by the local irritation; there is also a risk of tetanus making its appearance.

The causes of the grave character of these lesions are not, perhaps, difficult of comprehension. When early union does not take place, and repair has to be effected by what is called the 'second intention,' suppuration occurs; but the matter is formed not merely at the divided surfaces, as in ordinary wounds, but extends to, and accumulates in, a large and often intricate synovial cavity, which does not communicate freely with the surface, but allows of burrowing and confinement of the pus, and so favours its decomposition, with the consequent constitutional disturbances. The structure of some of the tissues which form the walls of the cavity is also most unfavourable when suppuration has occurred; instead of being vascular and full of life, soft and able to approximate and contract, the cartilaginous surfaces in the joints are unyielding, and so low in their vitality as to be little capable of efforts at reparative action; even when the cartilages disappear, the osseous structures which are exposed are themselves far less adapted for the process of granulation than the softer tissues, and obliteration of the pus-forming cavity becomes a slow and tedious process, often interrupted by local or constitutional mishaps. Finally, even if repair does take place, it has been effected at the expense of the functions of the part; for union of the opposing surfaces of an articulation involves anchylosis, and consequent loss of mobility—the purpose for which the joint was constructed.

When a wound exists in the neighbourhood of an articulation, it may be of such a size, and have so freely exposed the interior of the joint, that no doubt can exist as to its extent. In certain cases, however, it is not always easy to determine whether the synovial membrane has been injured or has remained intact. We are guided in our opinion by the position of the wound, its direction, the degree of penetration, and the form of the weapon. Our diagnosis may be assisted by the presence in the flowing blood of semi-transparent glairy synovia in thin lines or streams; but the absence of synovia does not prove that the articulation is uninjured (for its escape may be prevented by various circumstances), and its presence is not conclusive in favour of injury, for the fluid may have been discharged from a synovial bursa or from a tendinous sheath. When any doubt exists, researches with a probe had better be avoided, and the case treated at first as if penetration had undoubtedly occurred.

The dangers attendant on a wound extending into an articulation are influenced by several circumstances. In early life such wounds are usually attended with less severity of symptoms than at a more advanced age, and a good constitution is more likely to do well than one which has been broken down by prolonged debauchery. A small joint will escape with impunity where a large one would be destroyed; and even if the articulation is destroyed, the general disturbance may be trifling. The upper extremity is more favourably situated than the lower, as far as the chance of recovery is concerned; and finally a wound inflicted with a sharp instrument is more likely to unite than one which has been attended with much violence to the softer tissues.

In managing a wound of a joint, it becomes evidently of the highest importance to procure, if possible, immediate union, and prevent the occurrence or check the spread of inflammation. Every wound involves a tendency to inflammatory action; but the smaller the amount which is excited, and the more complete the absence of inflammatory exudation, the better the form of healing which occurs. The size of the wound, and the degree of violence with which it was inflicted, are elements in th production of inflammation over which we have no control; third element is the duration or amount of exposure to th atmosphere; this is within our reach, and the importanc which has long been attached to the prevention of access of ai to a wounded joint is fully justified on theoretical as well as o practical grounds.

When there has been much laceration and contusion of th soft parts, little or no chance of immediate union exists. Fo the description of the management of this class of wounds however, the reader may conveniently be referred to the essay which treat of Gun-shot Wounds and of Compound Disloca tions; for contused wounds of joints usually fall within one o other of these two categories. In punctured or incised wounds if seen at a sufficiently early period, the treatment is directe to procure rapid union, and prevent the occurrence of inflammation, or reduce it to a minimum. For this purpose, w retain the wounded surfaces in close apposition, and adopt suc measures as will insure perfect immobility of the joint, whils we exclude all exposure to the air. If any foreign or detache body is present—a piece of glass, for instance—it is carefull removed, and the wound, having been gently cleaned an thoroughly washed with a solution of carbolic acid, must the be closed effectually, and its surfaces, for their entire depth kept in close and steady apposition. The mode of effectin this must vary; where only a small puncture exists, it may b sufficient to apply a piece of lint, which may be soaked i carbolic oil or blood, or covered with collodion; if the wound is o some extent, something more is required; on the whole, sutures are preferable to adhesive plasters, being less liable to be disturbed, and admitting of the application of moisture to the part; the twisted suture appears to be the most efficient, as it maintains the divided surfaces in contact to a considerable depth. The wound may then be protected from the air by a covering of stout tin-foil, previously washed with the solution of carbolic acid, and nicely adapted to the surface, this being again covered by a rather larger piece of lac plaster charged with carbolic acid, and a fold of lint dipped in carbolised oil (as described by Mr. Lister) applied over the plaster and renewed, by being moistened with the oil, once at least in twenty-four hours; the under dressings of course not being interfered with unless it becomes absolutely necessary to do so. The limb must be carefully secured on a splint, or otherwise fixed in that position which will be most advantageous to the patient should rigidity ultimately occur. As perfect immobility is of the greatest importance, the splint must be carefully selected, so as effectually to prevent any articular movement. The immediate and continued application of cold to the part, in the form of irrigation or of iced water in vulcanised india-rubber bags, is usually attended with great advantage in preventing or subduing inflammation. The general treatment, at an early period, should be moderately antiphlogistic, without permanently lowering the strength, great demands on which may be expected should events take an unfavourable direction. Care should be taken not to disturb the antiseptic dressings so as to allow the wound to be unprotected by them, and the sutures may be left with advantage for many days, perhaps a week, or so long as there is any hope of union being obtained, unless their removal is required to give exit to matter.

In spite of the measures adopted, or in consequence of the case coming too late under treatment, inflammation may run high and suppuration occur. When matter has unquestionably formed, any attempt at union is abandoned, and free exit afforded to the pus, either by enlarging the original wound, or, if necessary, by making free incisions in a more depending position; but an attempt may still be made to arrest decomposition of the matter by the continued use of antiseptic dressings. The further progress of the case does not differ materially from that already described under the head of Suppuration in Joints (see p. 6), to which the reader is consequently referred.

PART II.

DISEASES OF INDIVIDUAL JOINTS.

The limited space at my disposal requires that any observations I have to offer respecting the peculiarities presented by disease as it affects individual joints should be extremely brief.

Diseases of the Hip.

Lesions of the hip have attracted especial attention from the importance of the articulation involved, the depth at which it is situated, the mass of soft parts which surround it, and the little leverage afforded by its upper attachment in the pelvis.

At the same time, unfortunately, disease of this joint is met with only too frequently, and constitutes one of the most troublesome lesions to which the human frame is liable.

As in other joints, the structures in which disease for the most part commences are the synovial membrane and ligaments and the articular extremities of the bones. Mr. Aston Key was of opinion, from the amount of mischief which is sometimes found in the ligamentum teres at an early period of the disease, that this was the part in which inflammation usually commences. At any rate, there is reason to believe that the ligaments (including the capsule) are often among the earliest structures to be affected.

Acute arthritis of the hip, whether occurring primarily, or in the course of chronic disease, is very serious and often fatal. The symptoms are usually unmistakeable, and if matter forms, as is often the case, it should be evacuated early, and antiseptics freely used. The expediency of amputation or excision must be judged of by the circumstances attendant on each individual case.

Common synovitis, as a primary affection, is less frequent in the hip than in the superficial joints; though when it occurs, its symptoms are usually severe, and the suffering experienced considerable.

Morbus coxarius; *strumous synovitis and ostitis.*—The disease of the hip which is most common, and which is so often met with in early life, is chronic or strumous inflammation, sometimes commencing in the synovial membrane or ligaments, but frequently, also, in the articular extremities of the bones. In retaining the term *strumous*, however, we must bear in mind that, as already stated, it by no means follows necessarily that there is a special tendency to tubercular deposit in the joint or in any other part of the body, or that such general cachexia exists as will prevent reparation of the local mischief. If attention to the general health is *desirable*, attention to the local treatment (especially in the form of securing the joint in a most perfect state of rest), is *indispensable*, and any neglect of it on the part of the surgeon hardly admits of excuse.

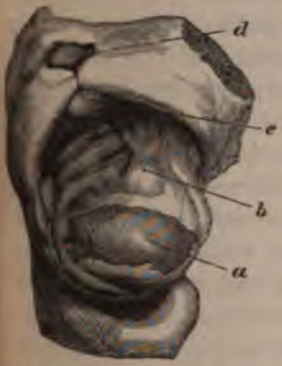
It is of great importance to recognise chronic hip-disease as early as possible, before permanent mischief has occurred. The first symptoms to be noticed are, a slight limp in walking, with disinclination to bear the whole weight of the body on one particular limb; if attention is now carefully drawn to the patient, the thigh will probably be found to be slightly flexed on the abdomen, and a certain amount of feverishness may be noticed towards evening, after the day's exercise, with a little restlessness during the night, accompanied, perhaps, with slight occasional twitches or jumps of the thigh, which will usually be somewhat flexed and adducted during sleep. If a careful examination of the hip is now made, it will be found to be held a little stiff, and some pain will be evinced on moving the joint or on pressing the articular surfaces together, either directly at the great trochanter or front of the joint, or indirectly through the foot.

If these symptoms are not attended to, and the disease proceeds a stage further, the lameness becomes very marked, the limb will be found apparently altered in length, flattening of the nates will be detected on examination, and very decided pain will be complained of. The causes of the apparent alteration in length are mechanical. The thigh is flexed on the pelvis, but combined with this flexion, which is very seldom *simple*, are two principal deviations; in the one case we find inclination and rotation *outwards*, attended with apparent elongation of the limb; in the other, there are inclination and rotation *inwards*, producing apparent shortening. Now, supposing the femur to be bent at an angle on the pelvis, and the foot turned out, when the patient tries to stand or walk the weight of the limb has to be supported, but in order that the foot may reach the ground, that side of the pelvis is depressed and advanced in front of the other; in this way the limb *appears* to be elongated. In the opposite condition of flexion combined with adduction and rotation inwards, the corresponding side of the pelvis, for a similar reason, is raised and carried backwards; a position which involves apparent shortening when an attempt is made to place the limbs parallel with one another. The position which is recommended as best suited for examination is that in which the trunk and the *sound* limb are perfectly straight; the nature of the alteration, as it affects the diseased side, is then more evident than if the two thighs are placed parallel.

The fixed and altered direction of the affected extremity soon entails secondary deformity in other parts, especially in the spine. When the thigh is fixed at an angle with the pelvis, in order that the weight of the extremity may be supported, the pelvis itself becomes inclined forwards; to compensate for this inclination and maintain the balance of the body, the vertebral column is strongly curved, producing a deep hollow in the lumbar region, with corresponding projection of the abdomen anteriorly. The exact nature of this secondary deformity is readily seen, either in the recumbent or in the erect posture, on supporting the affected limb at the angle which it has assumed, when the pelvis and spine may easily be restored to their natural direction. Lateral deviation of the spine may also be induced, to compensate for the lateral inclination or twisting of the pelvis. The pelvis, it will be noticed, shifts or alters its position; and, indeed, increased mobility of the pelvic articulations often occurs to an extraordinary extent, especially in the later stages of hip-disease, when recovery is taking place, with anchylosis or rigidity of the hip itself. In such cases, in early life, the amount of motion which becomes developed at the sacro-iliac synchondrosis and other neighbouring joints may closely imitate the natural mobility of the hip, and easily deceive a careless observer.

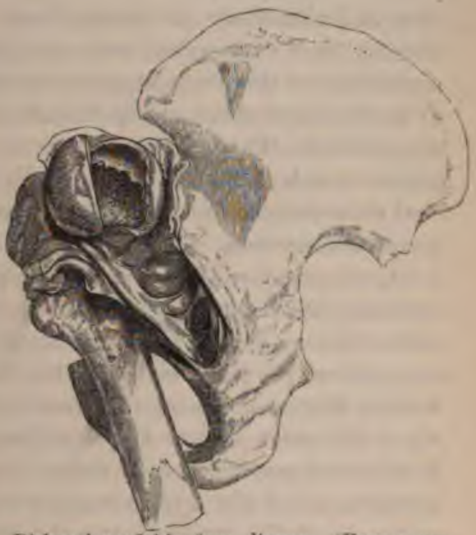
The condition of apparent shortening frequently follows that of apparent lengthening, though it may occur where no lengthening has ever manifested itself. Is there ever any *real* alteration in length? Though many causes have been advanced which might give rise to actual elongation of the limb, it is hardly probable that any of these should actually occur, and it may be said that the lengthening is, in truth, only apparent, depending on the altered position of the pelvis. In the early stages of hip-disease the same observation holds good with respect to the opposite condition. In other cases, however, a certain amount of genuine shortening really does take place. When the osseous structures are involved in the disease, the spasmodic contraction of the muscles maintains constant pressure of the head of the femur on the upper part of the acetabulum; if this is already softened, and the cartilages ulcerated or absorbed, the border or edge of the acetabulum yields to the pressure, it becomes deeply ulcerated and excavated, and the head of the femur itself, which has been more or less disintegrated, is drawn up into this excavation, which is enlarged to receive it, in the direction of the external iliac fossa. This condition constitutes what has been termed *spontaneous dislocation* from disease, which differs evidently from traumatic dislocation, in which the head of the femur clears the rim of the acetabulum which remains intact. When this false or incomplete luxation has occurred, the trochanter major will be found to be displaced upwards, and a certain amount of real diminution in the length of the limb will be present, increased, of course, if the head of the femur is destroyed to any extent. In some cases, however, *true* luxation from disease actually occurs, as may be seen in the accompanying illustration, taken from a preparation in the Museum of St. George's Hospital, in which the head of the femur is situated very near the anterior superior spine of the ilium. In very exceptional cases, too, the head of the femur is forced through the acetabulum, so as to enter the pelvic cavity.

Fig. 215.



Necrosis of the acetabulum. (From a preparation in the Museum of St. George's Hospital.) *a.* Head of femur, extensively exposed by abscess in the joint. *b.* Tissue containing the remains of the ligamentum teres. *c.* Loose necrosed portion of the acetabulum. *d.* Perforation of the acetabulum corresponding to the necrosed portion.

Fig. 216.



Dislocation of hip from disease. (From a preparation in the Museum of St. George's Hospital.)

Another, and a very striking change, which will be found at a comparatively early period, consists in a certain amount of alteration in the fulness of the nates. These are often flattened and appear wider than natural. This alteration depends partly on wasting of the gluteal muscles from want of use, partly also, in the position of abduction, on the twist of the pelvis and consequent diminution in the projection of the tuber ischii.

The pain which is experienced is not confined to the hip, but is often referred to the inner side of the knee. It is due probably to pressure on, or irritation of the branch of the obturator nerve distributed to the capsular ligament and ligamentum teres, referred sympathetically to the terminal cutaneous branches of the same nerve. In the same way, if the articular branches of the anterior crural or sciatic nerves are more particularly involved, we may find the pain referred to the front or outer side of the knee, or even to the heel or ankle. From whatever cause it arises, this pain is sometimes the first symptom which attracts attention, and may lead to mistakes regarding the real seat of the disease. The chance of error is increased if puffiness over the knee accompanies the pain, as it does sometimes; just as swelling of the testicle may be produced by the passage of a calculus along the ureter, from pressure on the spermatic plexus, and consequent nervous disturbance of the nutritive conditions of the parts supplied by its peripheral branches.

In the third stage of hip-disease, all the symptoms are much aggravated. The starting pains are very violent, rendering the nights much disturbed. The limb is still more distorted, and real shortening is often present from the incomplete luxation already described. There is much fever with increased local heat, suppuration has now taken place, and crepitus may be detected when the articular ends of the bones are moved on each other. When abscesses form, they may point in almost any part of the limb, either in the vicinity of the joint, or after having burrowed among the muscles to a great extent, especially when the erect posture has been long maintained. If the sinus is situated some distance down the thigh, near the inferior attachment of the tensor vaginæ femoris, the probabilities are in favour of the femur being the seat of mischief. When the acetabulum has originated or participated in the disease, and matter has formed in the pelvis, the abscess often shows itself at the outer part of the groin in the neighbourhood of the antero-inferior spine of the ilium; occasionally it passes down by the rectum, into which it may burst, or it may reach the surface close to the anus.

There are one or two points in the diagnosis to which I may briefly direct attention. I have seen congenital dislocation mistaken for hip-joint disease, and the child subjected to much unnecessary confinement and suffering. A little attention readily distinguishes the two affections. The history of the case, and the existence of evident limping from the first moment when any weight was allowed to rest on the limb, the absence of pain, and the extent of real shortening, aggravated when the limb is pressed upwards, diminished when extension is made, are symptoms of congenital dislocation which differ widely from those which would have been presented by severe disease of the joint. We occasionally meet with cases in which a difference in the length of the two lower limbs exists, resulting in some instances from congenital malformation, in others from infantile paralysis, which has led to wasting and defective growth of one extremity. Such a condition, if existing to any extent, causes limping in the act of walking, and leads to secondary deformity of the spine, in the form of lateral curvature, to counteract the tendency of the body to fall towards the affected side. This state might easily be mistaken for diseased hip, as well as for diseased spine, until a careful examination of the whole limb is instituted, when the cause of the symptoms is readily detected.

Psoas abscess, with or without disease of the spine, may be mistaken for hip-disease. A case of this kind, where the psoas abscess was connected with extensive tubercular disease in and around the kidney, came under my care at the Hospital for Sick Children, which had been considered and treated previously as disease of the hip. The limb, in such a case, may be flexed on the pelvis, and any attempt at extension give rise to great suffering; it will be found, however, that, provided the psoas muscle is kept relaxed and no traction upon it allowed, free movement of the joint may be effected, and its articular surfaces rotated on one another or pressed together with much force, but without suffering. The situation of the abscess, also, serves to assist in the diagnosis, for pelvic abscess, depending on hip-joint disease, is almost invariably complicated with sinuses in other situations. Inflammation of the bursa under the psoas-iliac may simulate hip-disease, and be with difficulty distinguished from it. Sometimes, indeed, the bursa communicates with the joint, and disease beginning in the one involves the other in its course. If such is not the case, and the inflammation is confined to the bursa, there will be pain and tenderness on pressure at the front and inner part of the joint, with, it may be, some indistinct swelling in that situation; the mass of muscles, however, obscuring the bursal tumour. The limb is usually instinctively flexed on the pelvis, as in hip-disease, and any attempt to extend the limb, or any movement which involves traction on the psoas muscle, is attended with suffering. The diagnostic marks correspond to those just mentioned. If care is taken to avoid any pressure on the bursa, or action of the psoas, the joint may be freely handled without suffering; moreover, no tenderness or swelling can be detected behind the trochanter.

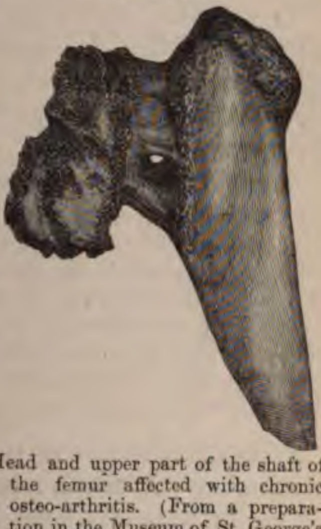
The treatment of strumous disease of the hip does not differ materially from that already recommended for strumous inflammation of the joints generally. If detected at the earliest stage, complete rest of the joint, at first in bed, afterwards by means of a splint, which must be long enough to secure perfect immobility of the hip, will be sufficient. But the rest must be continuous and maintained for an adequate period, the general health being at the same time properly attended to. In the second stage, when the limb is apparently altered in length and some starting pains have manifested themselves, confinement to bed for a long period is necessary, and extension by means of weights, to relieve the muscular spasm, may be used in the way already described. If the thigh is flexed and adducted, it must be straightened, which can be done readily enough under chloroform when the disease is recent, and with care and caution even at a later period when adhesions have taken place.

When suppuration has occurred, if the symptoms are not very urgent it is usually better to abstain from opening the abscess, as absorption may be expected occasionally to take place. If there is great pain, and the matter is too deep-seated to be reached conveniently, relief is sometimes obtained, temporarily at all events, by a few lines of the actual cautery. If the pain and distress are still very great, an opening may be made either with a knife or a trocar. In some cases where it is necessary to let out deep-seated matter, in order to avoid a large vessel, the mode recommended by Mr. Hilton may be employed, viz., after making a small incision through the superficial structures, to force a probe-director through the soft parts into the cavity of the abscess, and when pus flows along the groove of the director, to introduce a pair of fine dressing forceps into the abscess, and enlarge the opening by forcibly separating the blades.

If the case has gone on unfavourably, the bone become carious, and extensive suppuration taken place, resulting in sinuses, the health suffers, and the only chance of recovery, or even of preserving life, may consist in excision of the head of the femur, or removal of the diseased bone. Such an operation, in children at any rate, is more formidable in imagination than in reality, and I have had occasion to perform it without any injurious consequences. The subject of excision, however, will be treated of in a separate essay.

Morbus coxæ senilis.—In advanced life another form of disease is apt to occur in the hip, which is known by the name of the *morbus coxæ senilis*, or *chronic osteo-arthritis.* Unlike strumous inflammation, this disease seldom occurs under the age of forty, and often appears as a local affection, without any visible impairment of the general health. In chronic arthritis of the hip, there is stiffness of the articulation, and a certain amount of dull pain extending down the *front* of the thigh; the pain, however, though augmented after much exercise, diminishes during the night, and is not increased even by rough pressure of the articular surfaces against one another. The mobility of the joint is much interfered with, and a loud crackling can be distinctly heard when the limb is exercised. When the disease is well established, the foot is much everted, the nates are flattened, and there is *apparent* shortening of the extremity to a very considerable extent, in consequence of elevation of the corresponding side of the pelvis; a certain amount of *real* shortening may also take place after a time, from the changes which occur in the femur, the head of which may become altered in shape, and flattened, whilst the neck may assume a horizontal direction, so that the upper extremity of the bone may be placed below the level of the trochanter major. At this stage of the disease, too, bony protuberances may perhaps be felt around the articulation. The characters enumerated are so distinct from those of strumous disease of the hip, that mistakes between the two can scarcely arise. From sciatica it is distinguished by the character and situation of the pain, as well as by the presence of shortening of the limb, real or apparent, and eversion of the foot. The appearances presented somewhat resemble those of fracture of the neck of the femur, for which it might possibly be mistaken if any injury or accident had previously occurred. The history of the case, however, and the slow and gradual progress of the symptoms, as well as the osseous growths which are apt to form, are sufficient for accurate diagnosis. Where

FIG. 217.



Head and upper part of the shaft of the femur affected with chronic osteo-arthritis. (From a preparation in the Museum of St. George's Hospital.)

constitutional symptoms are present, the disease extends to other and smaller articulations, and the character of the affection cannot fail to be recognised. The treatment of this affection is noticed in the section on Chronic Rheumatic Arthritis.

Neuralgia of the hip.—This joint is frequently the seat of hysterical pain, closely simulating structural disease. The diagnostic characters of this affection have already been pointed out (see Articular Neuralgia). It may be remarked, however, that apparent shortening of the limb may be present in these cases, owing to alteration in the direction of the pelvis and its relation to the vertebral column, induced by long continuance in one unnatural posture. Lateral curvature of the spine also is frequently noticeable; but the nates are not flattened, and abscesses do not form.

Diseases of the Pubic, Sacro-iliac, and Sacro-coccygeal Joints.

These articulations, in consequence of their anatomical arrangement, are less exposed to disease than the proper diarthrodial joints of corresponding size.

As a consequence of hip-disease, especially in early life, the pelvic articulations become unusually movable; to such an extent indeed, that rigidity, or even complete anchylosis, of the diseased hip-joint may be attended with but little loss of the mobility of the limb.

Disease of the symphysis pubis is very uncommon.

A case, however, of extensive ulceration of its fibro-cartilage, with superficial caries of the articular surfaces of the contiguous bones, accompanied with a large abscess in the sheath of the rectus, occurring in a female, will be found in the ffith volume of the *Pathological Transactions*. Dr. Humphry also quotes a case related by Otto, in which the symphysis, as well as the right sacro-iliac joint were completely ossified in a middle-aged woman. Two other cases of ossification are also referred to, but anchylosis is undoubtedly very rare.

Acute inflammation of the sacro-iliac joint may result directly from injury. A case is related by Louis in which a sack of corn fell on the loins of a man who was stooping at the time. The accident gave rise to some swelling of the part, followed after a time by violent pain and much febrile disturbance, and death ensued at the end of the twentieth day. Very extensive inflammation, attended with suppuration, was found in the right sacro-iliac articulation, and the bones were separated to a certain extent from one another.

Disease of the sacro-iliac joint may arise in connection with pregnancy or parturition. During pregnancy the union between the pelvic bones is said to become less firm, and in certain cases the relaxed condition of the sacro-iliac joint is so considerable as to give rise to pain, as well as to difficulty in standing or walking; during exercise, too, the patient may be sensible of a certain amount of motion between the sacral and iliac bones, and sometimes a distinct 'crackling' can even be heard. In most of these cases the ligaments resume by degrees their normal condition, and the pain and limping gradually subside. Occasionally, however, the relaxed condition may last for a considerable period, and the limping may continue for months or years, or even, according to Ludovic, for the remainder of life. It may happen, too, that actual inflammation of the joint is set up; the pains become violent; there is swelling about the part; and if suppuration takes place, the case is most likely to terminate fatally.*

Sir B. Brodie relates the case of a married lady who was unable to walk without crutches, and who experienced pain after taking exercise, referred to the right groin as well as to the right sacro-iliac articulation, where a projection existed, as if the ilium had been displaced and drawn upwards; the affected limb was two inches *shorter* than the sound one. Pains resembling sciatica had been complained of for many years, but the first distinct symptoms of the affection appeared to be referred to her pregnancy, four years previously. Recovery took place, though the limb remained permanently shortened. Mr. Hilton also relates a case of sacro-iliac disease, occurring after parturition, attended with suppuration within the pelvis, in which the abscess subsequently became absorbed and a cure was ultimately effected after prolonged mechanical rest.

The chronic form of *sacro-iliac disease* is often traceable to some local injury, though Mr. Erichsen (to whom we are indebted for a very excellent description of this affection), considers it to be usually strumous in its origin. The symptoms consist mainly in pain in sitting and standing, or even lying on the affected side, as in any of these positions the weight of the body tells upon the inflamed part. The pain may be localised by direct pressure on the affected joint, or by pressing the bones together or the sacrum forwards, and in many cases a little puffiness with some elevation of temperature may be detected in the sacro-iliac region. Frequently, however, as Mr. Hilton points out, the actual seat of the disease may be masked by the pain being referred (through the nerves in relation with the joint), to the hip, knee, or back part of the calf, whilst the psoas muscle may be kept spasmodically contracted from nervous irritation, giving rise to a flexed condition of the hip. There is an absence, however, of any increased warmth in these parts, and by taking care to keep the pelvis quite at rest, the other joints may be moved freely without producing pain. When suppuration takes place, and in most cases it only does so at a late period of the disease, the matter may point posteriorly in the immediate neighbourhood of the articulation, or it may extend outwards to the great trochanter, or upwards to the loin; if, on the other hand, the matter accumulates in front of the joint, it may pass into the perinæum or even open into the rectum, or it may leave the pelvis by the great sciatic notch and point in the gluteal region.

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* See Desormeaux, *Sur les Relâchements, Écartements, etc. des Symphyses du Bassin.*

The affections with which sacro-iliac disease is most likely to be confounded are diseases of the hip and spine, but by careful attention to the points indicated, the real seat of the mischief can generally be made out satisfactorily, except, perhaps, when the disease is situated at the junction of the last lumbar vertebra and sacrum, and affects mainly one side.

When sacro-iliac disease is in an advanced stage, and especially when matter has formed to any extent, the prognosis is by no means favourable. In an earlier stage, however (and hence the importance of accurate diagnosis), a cure may not unreasonably be expected, as Mr. Hilton relates several cases, occurring at varying ages, to show that by giving perfect and prolonged rest in the recumbent position, and by steadying the pelvic bones by means of a strong and broad belt so as to favour anchylosis, recovery will often take place.

Disease of the sacro-coccygeal joint is occasionally met with as the result of injury, and, for anatomical reasons, more frequently in females than in males, in early life than at an advanced age. The symptoms, as described by Mr. Hilton,* are tenderness with increased heat about the joint; pain on defæcation as well as on rising from a seat or sitting down, and on walking or running rapidly, the pain in these movements being caused by the action of the corresponding muscles attached to the coccyx.

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* Hilton, *On Rest*, p. 424.

There is also pain on direct pressure on the joint, and on moving the coccyx when grasped between the thumb and the fore-finger introduced into the rectum. Rest in the recumbent position, and the prevention of constipation by appropriate diet and the use of laxatives, constitute the treatment recommended.

It may be remarked that symptoms very nearly resembling those mentioned are often met with in hysterical females. In these cases, however, the temperature about the part is not increased, and there is an absence usually of pain when the coccygeal bones are moved in the way previously described.

Diseases of the Knee.

The diseases of the knee have been studied with extreme care, owing to the frequency of their occurrence, as well as to the size and accessible position of the articulation. Hence it is that the affections of this joint are often taken as typical of articular disease generally. The knee is liable to the various morbid changes which have been described in the first part of this essay; to one of them, indeed—chronic inflammation of the articular extremities of the bones—it is specially exposed, for *local abscess* is more common in the head of the tibia than in any other situation; and necrosis of the lower end of the femur is often met with, at first simulating, but subsequently inducing, suppuration of the joint.

The position which the limb habitually assumes in severe disease of this articulation, whether simply inflammatory or strumous in its origin, is one of considerable flexion, frequently combined with torsion, in consequence of eversion or inversion of the foot. If the ligaments become extended or destroyed in the progress of disease, the spasmodic contraction of the flexor muscles acts upon the head of the tibia, which it tends to dislocate backwards into the popliteal space. In our treatment, therefore, we have to guard against this tendency; the foot must be supported to prevent torsion, the limb must be maintained uninterruptedly in a nearly *straight* position, and extension by weights may be used as in the case of hip-disease.

In *chronic osteo-arthritis*, the knee-joint soon acquires a strong inclination *inwards*, whilst the tibia is usually rotated outwards and the foot everted. At a more advanced period, if the limb becomes rigid in a semi-flexed position, the patella is occasionally found resting on the outer condyle of the femur, or even completely dislocated outwards. The amount of synovial effusion is considerable in the earlier stages of the disease, and the swelling will often be found to extend to the popliteal space in the direction of the inner head of the gastrocnemius, owing to distension of the bursa which exists in this situation, and which frequently communicates with the joint. As the disease advances, the patella becomes increased in breadth, and ossific deposits may be distinguished at the condyloid margins of the femur and on the head of the tibia. Pendulous excrescences, or completely detached bodies (loose cartilages), are frequently to be found in the interior of the articulation.

The *deformities of the knee*, and the treatment they require, are discussed in the essay on ORTHOPÆDIC SURGERY.

Inflammation or dropsical distension of various bursæ in the neighbourhood of the knee-joint may often be met with. Besides the superficial bursa over the patella, which gives rise in its diseased condition to 'housemaid's knee,' there is a deep-seated bursa between the ligamentum patellæ and the tibia, which may also be inflamed, producing pain on motion, with ill-defined enlargement in the region of the anterior tuberosity of the tibia. Occasionally that part of the synovial membrane which extends upwards beneath the extensor muscles is replaced by a bursa, which may be quite distinct from the knee-joint; or an imperfect division of the membrane into two cavities may exist. When a separate bursa is present, it may be inflamed and give rise to a painful swelling, which is confined, however, to the region above the patella, the articulation below remaining unaffected: this diagnostic mark is most evident when the patient is in the erect position. A swelling is often met with, especially in children, at the inner side of the popliteal space, connected with the bursa placed beneath the inner head of the gastrocnemius. As this latter bursa frequently communicates with the synovial membrane of the joint, inflammation of it is a matter of some importance, and care must be taken in our surgical treatment. Inflammation may also take place in the bursæ in connection with the *patte d'oie* tendons at the inner side of the head of the tibia, leading occasionally to most obstinate and prolonged suppuration, and interfering with the movements of the joint, which does not, however, *directly* suffer.

It may be remarked, that in *wounds of the knee-joint*, when suppuration occurs, it may take place insidiously in the areolar tissue, between the thigh-bone and the muscles which surround it, rather than in the articulation itself. In this way the whole thigh may be inflamed and swollen, and the appearances somewhat closely resemble those of acute periostitis of the femur. The depth at which the matter is situated prevents it from coming rapidly to the surface, and does not readily allow of fluctuation being detected. Much constitutional disturbance is, consequently, usually present, and the amount of pus which forms before an outlet is obtained is often very large. In such cases early and deep incisions are obviously called for; incisions which shall extend through the whole muscular layers, if the seat of the suppuration is to be reached, and the symptoms produced by the pent-up matter abated.

Diseases of the Ankle.

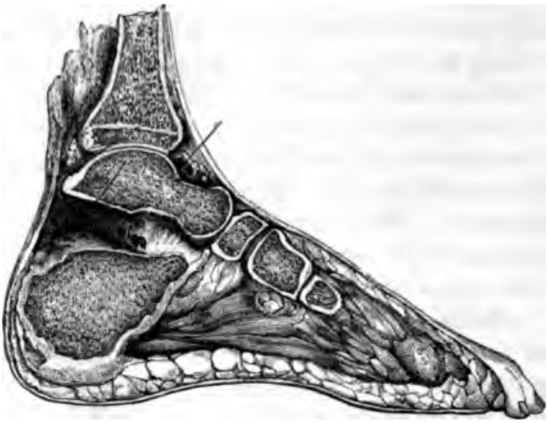
The ankle-joint is liable to the various diseases which have been already described, and is often involved in the progress of caries affecting the irregular bones of the tarsus; occasionally, indeed, it is not easy to decide whether the disease actually affects the ankle, or is confined to the astragalus or calcaneum; the point may, however, be determined by the free motion in the latter case of the ankle-joint when the patient is placed under chloroform. When the joint is distended with fluid, the tumefaction and fluctuation are most evident between the two malleoli, on either side of the extensor tendons; in extreme cases, the effusion is perceptible also posteriorly, at the inner and outer borders of the tendo Achillis. When suppuration occurs, the matter may make its way to the surface in the immediate vicinity of the joint, or it may ascend the leg, or descend into the foot in connection with the tendinous sheaths around the ankle, so as to open at a considerable distance. The direction which the foot is prone to assume in disease interfering with the use of the joint is that of flexion, combined generally with varying amounts of inversion or eversion. The position to be selected, on the other hand, to avoid present stretching of the ligaments, and as most useful in the event of anchylosis, is that in which the foot is in the same plane with the leg, and forms with it an angle only slightly exceeding a right one. It may be remarked, that disease of this joint is more favourably situated for recovery than disease of the thigh or knee, because, by the employment of a wooden leg, whilst the ankle is carefully supported by splints, exercise may be taken, and the general health consequently maintained.

Chronic osteo-arthritis seldom affects the ankle, but when it does, the tarsal joints are usually implicated at the same time. Increase in the breadth between the malleoli, which are preternaturally prominent, combined with projection inwards of the scaphoid and depression of the instep, are the appearances commonly noticed.

Diseases of the other Articulations of the Foot.

The tarsal bones are so small, and the articulations between them so numerous and in such close proximity, that distinctions between the morbid conditions of the two can with difficulty be drawn. Disease in the tarsus, in the majority of cases, arises in strumous inflammation of the bones, which soon extends to the cartilages and to the synovial membranes. Occasionally, however, an articulation is the starting-point, as may be seen represented in the accompanying illustration (taken from a preparation in the St. George's Hospital Museum), in which the disease is found commencing in the joint between the astragalus and calcaneum. Some importance must be attached to the original seat of the mischief, in consequence of the varying degrees of simplicity of the synovial membranes; of these, the median, or *scapho-cuneiform*, is by far the most complicated, as it extends between so many tarsal bones. When disease involves only the simpler synovial membranes, or is confined to single bones in con-

FIG. 218.



Disease of the tarsus, commencing in the joint, between the os-calcis and astragalus. (From a preparation in the Museum of St. George's Hospital.)

nection with them, the probabilities of a successful issue are comparatively great; and if operative measures are necessary, excision of individual bones may be had recourse to with satisfactory results. I have several times removed the calcaneum, the cuboid, or even the internal cuneiform, and recovery has occurred with a very useful foot. When disease affects the astragalus or the scaphoid, on the other hand, and the contiguous synovial membranes are implicated, the chances of localising the mischief become much diminished; though one or both of these bones can often be removed successfully, leaving a very effective foot.* The middle and external cuneiform bones, also, are unfavourably situated, though less so, perhaps, than the astragalus or scaphoid. It may be remarked, that the repair which takes place after excision in these cases is usually most complete, for a large portion of the periosteum is, and ought to be, left behind in the operation; reproduction of the bone consequently occurs to a greater or less extent, giving to the foot all the solidity which is required. After removal of the whole of the calcaneum, I have found the heel perfectly rigid, and the amount of deformity very trifling.†

Inflammation of the complicated *scapho-cuneiform* synovial membrane may be looked upon, according to Mr. Erichsen, as a distinct affection of the foot, commencing usually in disease of the scaphoid. At first there is pain and swelling in the region of the joint between the scaphoid and cuneiform bones. The pain is increased by bending down the foot, and extends across the tarsus to its outer side, as the articulation between the external cuneiform and the cuboid becomes involved. At a later period 'the foot assumes a remarkable bulbous or clubbed appearance; the symmetry of the heel and the outline of the ankle are unimpaired, but the fore part and dorsum of the foot are greatly swollen, glazed, and possibly perforated by sinuses discharging their unhealthy pus.' ‡

The diseases of the metatarsal and phalangeal articulations call for no special observations. They are frequently *gouty* in their character, or, in some cases, are examples of *chronic osteo-arthritis*. It is worthy of notice, perhaps, that in the metatarsophalangeal articulation of the great toe, the deformity indu by the latter affection has been mistaken for dislocation condition which it may closely resemble.

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* See Holmes, *Surgical Treatment of Children*, p. 502 et seq.

† See also *Pathological Transactions*, vol. xi. p. 217, for an account of the condition of the parts in a foot from which I had removed two of the tarsal bones.

‡ Erichsen's *Science and Art of Surgery*, 3rd ed. p. 715.

The subject of *bunion* is considered in the essay on SURGI AFFECTIONS OF THE SKIN.

Diseases of the Sterno-clavicular, Acromio-clavicular and Ster Joints.

A certain amount of enlargement of the *sterno-clavicular* well as of the *acromio-clavicular* articulations may sometimes seen in persons who have long been in the habit of work hard with their upper extremities. Acute inflammation of *sterno-clavicular* joint is also met with occasionally. Such a c in an adult came under my care, in which suppuration rapi took place, with destruction of the fibro-cartilage, induci spontaneous dislocation of the inner extremity of the clavi The shoulder and arm having been fixed, and the dislocat reduced and prevented from recurring by appropriate spli recovery took place with a useful extremity.

Disease of this joint is easily recognised, but, owing to great mobility and peculiar anatomical characters of the a culation, it is difficult to secure perfect rest and, for reasons, anchylosis is seldom met with. Cases of sterno-cl cular disease will be found related in Mr. Hilton's work on *R* and in the *Lancet* of April 1864.

Chronic osteo-arthritis of these articulations may also occ producing enlargement of the articular extremities of clavicle, stiffness and pain on movement of the joints, as as weakness of the upper extremity.

Disease of the *articulation between the first and second piec the sternum*, where no synovial membrane exists, is rare, but interesting case is related by Mr. Hilton, in which the princi symptoms were pain about the sternum, especially on cough or talking or making any respiratory exertion, with difficult breathing, and great tenderness on direct pressure on the joi Recovery ultimately took place.

Diseases of the Shoulder.

The shoulder-joint resembles the hip in its anatomical c racters, but is, fortunately, far less subject to disease, and w disease occurs the results are usually much less severe, the sistence of pain and the production of rigidity constituting the conditions most to be apprehended. If suppuration takes place, which is seldom the case, the matter often follows the course of the long tendon of the biceps, and opens at the front of the arm below the deltoid. Not unfrequently, too, it passes out of the articulation by the opening which exists in the synovial membrane beneath the subscapularis, and follows that muscle, arriving at the surface near the back and lower part of the shoulder. The most favourable position in which a diseased shoulder can be placed for treatment, is that which is almost naturally adopted; the arm should be parallel to the trunk, and the elbow slightly separated from the chest, the fore-arm being at the same time supported by appropriate mechanical means. If anchylosis takes place, owing to the great mobility of the scapula the arm may still be moved very freely, and the limb consequently remains very useful.

The condition of parts induced by *chronic osteo-arthritis* of the shoulder has, no doubt, been frequently mistaken for the result of injury. After the stage of synovial distension has passed, wasting of the soft parts occurs; rigidity, as well as crepitation on movement, are met with, and the head of the humerus appears to be elevated and carried forwards. When the disease is of long standing, the deltoid is atrophied. The capsular ligament is usually thickened, and has sometimes osseous particles in its substance, or it may be perforated at its upper part. The synovial membrane shows marked signs of inflammation. The glenoid fossa loses its ligament as well as its cartilage, and presents the characteristic ivory-like material; occasionally, too, irregular osseous growths are found around its edges, increasing its capacity. The under surface of the acromion, and even of the acromial end of the clavicle, may be hollowed out by pressure of the humerus upon them, and are often covered with a polished porcelain-like material. Separation of the acromion into two portions is also met with sometimes. The head of the humerus is often much enlarged, and its surface eburnated. The tendinous structures around the joint may appear partially disintegrated, and the intra-articular part of the long head of the biceps is usually destroyed, the remains of the tendon adhering to the edges of the bicipital groove.

Disease of the *deep-seated bursæ* around the shoulder-joint is occasionally met with, and may prove somewhat perplexing. The bursæ beneath the *subscapularis* and the *infra-spinatus* habitually communicate with the synovial membrane, so th their diseases are in fact those of the articulation itself. T bursa beneath the *deltoid* is distinct; and when that bursa inflamed, the muscle is rendered unusually convex, and a contraction of it is attended with pain. The articular surfac however, can be freely pressed together, and the joint exercis without suffering, provided the deltoid is not used, and pressure is made on the tumour. A sensation of fine crepit tion can often be felt in these cases on moving the shoulder.

Diseases of the Elbow-joint.

The diseases of the elbow resemble those of the knee, althou they are less severe in their character, and more favourable their results. This remark, indeed, applies, for obvious reaso to all the articulations of the *upper* as compared with those of t *lower* extremities. When effusion takes place into the synovi membrane of the elbow, the swelling is most evident at the ba of the arm, on each side of and above the olecranon; it is al perceptible at the outer side of the fore-arm, beneath t extensors. If suppuration occurs in the joint, the direction which the matter can make its way with the greatest ease upwards and backwards between the humerus and tricep abscesses point, therefore, usually at the borders of this muscl the outer being the border more commonly selected. Th synovial capsule may also give way in front, in which ca sinuses will be met with at the side of the brachialis anticu If the bones are diseased, however, the fistulous orifices m lead directly to the part which has become necrosed or cariou In cases of *strumous ostitis*, which is somewhat common in th region, complete death and separation of a portion of bone the olecranon, or in one of the condyles, frequently *with* b sometimes *without* the existence of caries, is by no mea unusual. A comparatively slight operation, therefore, is occ sionally successful in cases where excision of the articulati might at first sight have appeared necessary. The radius, may be remarked, is less prone to suffer than either the humer or the ulna.

The position in which the joint should be placed when splin are required, is that in which the fore-arm forms a right ang with the arm, and is in a state intermediate between pronati and supination. As the joint naturally falls into this positi in consequence of its affording the patient the greatest amount of relief, secondary dislocation is rare, the only one which is met with being luxation of the head of the radius outwards and backwards, depending probably on the hand having been kept in a state of forced pronation.

Chronic osteo-arthritis, when it attacks the elbow, is seldom confined to a single articulation, so that the nature of the affection is usually clear. Bony nodules and vegetations are of frequent occurrence in this disease, taking the form occasionally in the ulna of 'additamentary bones.' Detached or pendulous bodies are often met with, sometimes in great numbers.

Disease of the bursa over the olecranon, constituting 'miner's elbow,' can scarcely be confounded with disease of the joint. When inflammation attacks the bursa beneath the triceps, however, more care is necessary. According to Mr. Barwell, the condition here closely resembles that which is met with in the knee; a synovial bag existing between the triceps and the humerus, which may be a distinct bursa, or, as is more commonly the case, be a prolongation of the articular synovial membrane. Mr. Barwell remarks that, in inflammation of the bursa when it does *not* communicate with the joint, 'there will be no swelling or puffiness between the inner condyle and olecranon process when the arm is bent at right angles; but the infallible test is, that the line of junction between the head of the radius and the humerus is as clear and well-defined as ever. If, on the other hand, the inflamed structure communicate with the joint, then these parts will participate in the general puffiness and swelling.'*

Diseases of the Wrist, and other Articulations of the Hand.

The complicated relations of the various synovial membranes at the wrist and around the carpal bones facilitate extension of disease from one to the other; the anatomical arrangement explains also, to a certain extent, why it is that the bones are so frequently affected in articular disease of this region. The most favourable position in which the hand can be placed in disease of the wrist is one intermediate between flexion and extension, as well as between pronation and supination. This position is the one naturally adopted when the hand and arm are supported in a sling. In the recumbent posture, however, the hand usually lies on a cushion in a state of complete pronation a condition which places the posterior ligaments on the stretch and favours luxation backwards, the only form of spontaneou dislocation to be apprehended. In acute inflammation of th wrist, therefore, relief may often be afforded by so adapting th mechanical support as to obviate this tendency to pronation If luxation of the ulna has already occurred, and the triangula fibro-cartilage been destroyed, the hand must be secured in th position recommended, and pressure exercised on the back o the ulna to reduce its dislocation, and maintain the bone in it normal position. As stiffness of the fingers is very apt to occu from want of exercise in cases of diseased wrist, passive motion of their articulations must be had recourse to as early a possible.

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* Barwell, *On Diseases of the Joints*, p. 347.

Chronic osteo-arthritis of the wrist is most common in female beyond the middle period of life, though it is met with occasionally at an early age in both sexes. The back of the wrist in this form of disease exhibits usually a peculiar projection in consequence of enlargement and partial luxation backwards of the ulna, and, though to a much less degree, of the radius. The fingers are frequently distorted, becoming permanently flexed as well as adducted; the *second* phalanges, however, of the fingers, as well as of the thumb, are usually *extended*, giving to the hand a peculiar appearance highly characteristic of the disease in its advanced stage. Enlargement of the articula extremities of the fingers is very common, representing the 'nodosities' of Dr. Haygarth. Partial or complete luxation of them may also be present.

Synovial tumours, or 'ganglia,' about the wrist are treated a in the essay on AFFECTIONS OF THE MUSCULAR SYSTEM.

Diseases of the Temporo-maxillary Articulation.

The only affection of this joint to which it is necessar specially to direct attention is *chronic osteo-arthritis.* This disease usually attacks the jaw in old persons, though it has been seen in early life; generally speaking, too, it is constitutiona rather than local, and shows a marked disposition to symmetrical disturbance. The condyle and ramus of the lower jaw are usually enlarged and elongated; in a case related by Cruveilhier, however, the condyle was found to be entirely absent. The glenoid cavity is more or less altered, being frequently enlarged, and sometimes forming a plane surface. The articular cartilage and fibro-cartilage generally disappear, but the porcelain deposit is not common, and foreign bodies are rarely, if ever, present. The symptoms consist principally in stiffness of the jaw, and inability completely to open the mouth, with a crackling noise when the joint is used. The face is distorted; if only one articulation is affected, there will be some projection, and the face is turned towards the opposite side. When both articulations are diseased, the whole jaw is carried forwards. The symptoms are commonly less urgent than those presented by the same disease in other joints, but Dr. Humphry refers to a case in which this disease caused so much discomfort and distortion of the face, that he was led to excise the condyle of the affected joint, and with very good result.* A case, too, is related by Mr. Hilton in which osseous anchylosis of this articulation had occurred to a considerable extent on both sides, in a man in whom anchylosis was also found between the skull and atlas, as well as between some of the succeeding cervical vertebræ.†

ATHOL A. JOHNSTONE.

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* Humphry, *On the Human Skeleton*, p. 306.

† Hilton's *Lectures on Rest*, p. 105.

DISEASE OF THE SPINE.

THE spine is subject to a disease, commencing in its bones and joints, so formidable in its results, that it is emphatically called Disease of the Spine. From Caries being the kind of morbid action which invades the bony structures, that term is sometimes used to designate the disease. Owing to an angular projection or hump being formed in the spine at the chief seat of disease, and to distinguish it from Lateral Curvature, the name Angular Deformity is sometimes applied. The term Malady of Pott, derived from the first standard description of the disease having been given by our countryman, is still occasionally met with, but only in foreign works.

Disease of the spine is correctly included among those of the joints generally. The morbid action which leads to the destruction of parts of the bodies of the vertebræ and fibro-cartilages, is identical with what attacks other articulations. But as the spine combines several offices essentially distinct from each other, such as being a flexible column and at the same time the guardian of the spinal cord, its diseases present special characters, which justify their being treated of separately.

Caries: ulceration.—The disease called caries is generally considered to be a morbid process confined to bone. The part of the bone attacked, commonly circumscribed within a small area, at first, is gradually consumed by disintegration and absorption. The fibro-cartilages contiguous to the diseased bone undergo what appears a similar and simultaneous destruction of substance. And during the process, there is a constant discharge of pus, both from the bone and the cartilages. Hence it may be concluded that the diseased action in bone called caries, is the same that, witnessed in the fibro-cartilages, is called ulceration.

The question has been mooted as to whether the morbid process commences in the osseous or fibro-cartilaginous structures. It seems enough to know that when the disease has proceeded for a short time, all the textures yield indiscriminately to its destructive agency. In childhood, temporary cartilage enters into the composition; yet we find that bony, fibrous, fibro-cartilaginous and simply cartilaginous tissues are all disintegrated and removed in an apparently identical manner.

Anterior segment, the special seat of the disease.—An important distinction exists as to the segment of the spine to which the morbid action confines its attacks. It is a remarkable pathological fact, that spinal disease selects the bodies of the vertebræ, the fibro-cartilages, and the accessory ligaments, forming the anterior segment of the spine, as the particular objects of its invasion; to the exclusion of the pedicles, arches, transverse, oblique, and spinous processes, together with the ligaments and articulations, which form the posterior segment. That is, caries and ulceration commence in the anterior portion of the column, destroy it extensively from front to rear, and proceed both upwards and downwards; but they do not go backward, or cross the line of partition between it and the posterior portion. It may be deemed singular that, numerous as are the small joints formed by the opposing surfaces of the oblique processes, in the posterior segment, disease is scarcely ever witnessed in them. It will presently be seen that the structures of that segment have a remarkable disposition to take on reparative action, in antagonism, as it were, to the morbid action in front.

Disease of the spine occurs with equal frequency in the two sexes. It may commence at any period of life; but it is extremely rare past the middle term; it is most rife from early childhood to adolescence.

The disease is generally admitted to be one of the class called scrofulous; yet it is often met with in persons who do not otherwise show signs of that diathesis. Its origin is frequently attributed by the patient or friends to an accident, as a fall, that probably occurred a long time previously. But the evidence of the connection is seldom satisfactory. Greater importance is due to the unsound constitution which would cause such disproportionate effects to proceed from a slight injury.

Incipient stage of disease of the spine.—The symptom which commonly attracts the notice of the friends of the patient first, and which is also the most important in the mind of the surgeon, is a prominence of one, two, or more spinous processes at some part of the column.

Unprofessional persons will speak of that projection as a 'growing out' of the back. To the surgeon it is significant of a certain portion of the front of the spine having been destroyed by disease. He infers that an excavation there has caused the superior part to fall down at an angle to the inferior; and concludes that as the bend is directly forward, the loss of substance must be in the bodies of the vertebræ and intervertebral cartilages. The apex of the angle, it will likewise be perceived, will be formed by the spinous process of the vertebra in which the destruction has been greatest.

In the advanced stage of the disease, no symptom can be more easily detected than the prominence of the spinous processes; for the muscles in each trough will have become atrophied from want of use; and the ridge will stand out conspicuously, like a keel, with rugged, serrated edge, each knob distinct; the transverse and oblique processes may even be well-marked. But in the recent stage, when the angle has just begun to appear, there are sources of obscurity, which sometimes make the diagnosis difficult. The protuberance can be more easily discerned in some of the regions of the spine than in others. It can be recognised in the dorsal before it can in the lumbar; and the reason is obvious. The natural curve in the dorsal region, has its convexity presenting backward; the ridge of spinous processes is, therefore, comparatively superficial; hence a trifling increase of the natural bend, caused by the destruction of even a small part of one of the bodies, will be distinctly apparent. But it is different in the lumbar region; the natural curve there has its convexity presenting forward, and owing to the hollow in the back, the tips of the spinous processes are situated comparatively deeply. When there is loss of substance, therefore, in the front or convex aspect of the curve, consequent on carious ulceration of the bodies and intervertebral cartilages, it may be long before the spine will fall forward, and bend in the reverse direction, so that the ridge of spinous processes shall form a convexity and visible projection posteriorly. Moreover from the great depth and magnitude of the lumbar vertebræ, it is obvious that the destruction of their substance must be proportionally extensive, for the column to be bent at an angle. In the cervical region, the normal curve is similar in direction to that in the lumbar. When the disease, however, attacks the vertebræ there, the effects differ from what are observed elsewhere; the portion of spine above the carious ulceration does not fall forward; the weight of the head overcomes that tendency; and the result is that the head subsides vertically, so as to approximate to the upper part of the chest, and obliterate the appearance of the neck. Accordingly, the occiput comes in the way of an examination, preventing the tips of the spinous processes from being felt by the fingers.

But in reference to these normal curves of the spine, it is to be remembered that they are not properly established till about puberty; and that up to that age, the column is very flexible. A difficulty of diagnosis is, therefore, sometimes found in young patients, as a consequence of this suppleness; especially if they have been previously debilitated by illness. When a weakly child sits, he usually stoops; and if the spine be examined, the ridge of spinous processes will probably project conspicuously and alarm the parents; it is not unlikely, moreover, that the chief protuberance will be about the middle of the lumbar region, where a hollow might be expected in the adult. If it should be apprehended that disease of the spine was commencing, the point of greatest interest would be to observe whether there were any distinctly abrupt projection of one particular spinous process, to mark it as the apex of an angle, however obtuse. Should doubt still remain, the child may be laid on its belly, and the hips elevated to a higher level than the spine; if the structures be sound all appearance of the abnormal protuberance will then be removed; if, on the contrary, the projection be consequent on disease, it will continue to be perceived.

Rigidity of the affected portion.—For the detection of disease in the spine at an early period, no symptom is more valuable than diminution of the natural flexibility of the column at the suspected part. And the reason why that defect should indicate disease at its incipient stage, may be stated. Pathology teaches that as soon as caries and ulceration attack the bodies of the vertebræ and intervertebral substances, adhesive inflammation is set up in the adjoining structures, more particularly in the posterior segment of the spine. Coagulable lymph is thrown out in the interstices of the laminæ, joints, and processes situated at the back; and as the lymph solidifies the vertebræ become agglutinated and deprived of their natural mobility. Parallel instances are met with in diseases of the joints elsewhere: for example, an early symptom in hip disease is interruption of the free motion of the articulation. The rigidity of the spine may be made evident by the simple expedient of directing the patient to stoop forward, and rise alternately; or to incline his body first to one and then to the other side; if the column be carefully watched during these movements, and caries has commenced, a distinct contrast will be perceived between the natural flexibility of the spine throughout its principal extent, and an abnormal inflexibility in the portion occupied by about four or five adjoining vertebræ. The latter bones will appear to be moved as a united, compact mass. Or if the palm of the hand be planted broadly and flatly over the vertebræ suspected to be diseased, including some of the sound adjoining parts, and if the patient be asked to stoop and rise as before, a distinct sense of movement among the various processes will be communicated to the fingers at the sound part, while there will be an absence of such a feeling at the diseased part.

Heat and swelling.—When the disease is acute and the ulceration in active progress, both these symptoms will be present. The increase of temperature may be ascertained by the touch, but it will be certified better by the thermometer. The swelling is seldom such as to be prominent and distinct; it consists rather in a general fulness which partially obscures the forms of the bones. When considerable, it indicates an actively progressing condition of the caries. When absent, and the points and surfaces of the bones are visible and defined, it furnishes an argument for supposing that the disease is dormant and that anchylosis may have taken place.

Pain.—This, which is a faithful guardian in general of the textures of the frame, is a fallacious monitor in regard to disease of the spine. It fails to warn when danger is imminent, and it alarms needlessly. As a proof that carious ulceration of the vertebræ is not always attended with pain, it may be stated that numerous patients have gone through the whole course of the disease, so as to have angular deformity of the worst description, without having been confined to bed a week or day, from inability to go about. Again, other patients, almost always females, have suffered sharp pain in a part of the spine, from supposed disease, while every vertebra was perfectly sound. Nevertheless, in acute cases of real disease of the spine, pain in the affected part of the back is a leading symptom. It will be varied sometimes by the feeling of painful constriction about the epigastrium, as if a cord were tied round the waist. The act of raising the patient, or turning him round, in bed, will cause great agony. If his limbs be affected with convulsive startings the shock communicated to the spine will be attended with much pain. His nights will be sleepless. Such attacks do not commonly last long, but they are apt to recur; they indicate accessions of the acute morbid action.

In a large proportion of cases, pain is a subordinate symptom; and some devices are necessary to make it be felt. While the patient is upright, a shock may be given to the spine, by placing the hands on both his shoulders, and suddenly depressing them; the jerk will probably cause pain in the affected part. Or he may be asked to jump from a low stool upon the floor. Percussing each spinous process in succession is another mode. The plan of carrying a hot sponge down the spine, in the expectation of the warmth bringing out the pain, has not much to recommend it. When dull aching pain, always returning to the same part of the spine, follows exercise, jolting in a carriage, or sitting for a long time, it betokens latent disease.

Neuralgia of the spine.—It is necessary, for assisting diagnosis, to notice here a kind of pain which fixes itself in some particular spot of the spine, and is liable to be mistaken for a symptom of organic lesion. It differs from those pains in the back which can be traced directly to rheumatism, dyspepsia, diseases of the kidneys, or of the uterus, or ovaries. The affection is nervous and functional. It may be considered to have the same relation to the spine which clavus hystericus has to the head. Pains resembling it visit different parts of the body; but they have one common character in affecting females prone to hysteria almost exclusively. Sir B. C. Brodie gave to them the name 'hysterical neuralgia.' They are not uncommon in the joints generally, particularly the knee. When that articulation is affected, the pain may be of long duration, exhausting to the constitution. It has fallen to the lot of the writer to have witnessed two cases of that hysterical neuralgia of the knee-joint, in both of which the patients, young females, consented to lose their limbs on account of the severity of the pain. They were under the care of the same surgeon, who conceived that their sufferings were owing to acute ulceration of the cartilages of the joints, requiring amputation: and chloroform had not then been introduced. In both cases, the cartilages and all the other structures of the joints were found, after the operations, to be perfectly healthy. The lesson taught by these examples, and enforced by other considerations, is that, when the spine is affected with similar pains, they may be acute and long persistent, without boding actual disease.*

Every part of the spinal column would seem equally prone to be affected with this neuralgia. Perhaps it may be met with more frequently at the site of the 'vertebra prominens,' than elsewhere; and when seated there, the protuberance of the spinous process increases the fear that disease may be its origin. A peculiar feature of the pain is that it is circumscribed within a small area, so that the part might be covered with the point of the finger; and the description often given is that it resembles what might be produced by a nail being driven into the side of the spine. The actual suffering to which the pain gives rise, is undoubtedly great; but the effect on the patient's mind is not the least of the evil consequences. She becomes the victim of unfounded apprehensions as to the nature of her complaint—being commonly possessed with a conviction that a frightful corroding ulcer, of some kind, is destroying her spine. Forthwith she is furnished with an invalid bed; and months or years may elapse before she rises from it.

The main points which deserve attention, in forming a diagnosis, are: 1, that no appreciable angular deformity exists; 2, that there is no perceptible rigidity in the affected part; 3, that while undergoing the examination, the patient will wince and jerk the body, each time the spine is touched; which is contrary to what she would do if the pain depended on disease: lastly, in reference to those cases in which the pain in the back has lasted over many months, and the lady has been confined all the while to her couch, and yet no deformity is apparent—which is the history of almost all these neuralgic cases—it may be argued that, if caries had been engaged, all the while the pain was felt, in destroying the vertebræ, deformity of an unmistakable kind would have been produced.

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* The subsequent history of one of these patients was not a little remarkable. Although the stump was apparently sound, it soon became the seat of pain, equal to what had been felt in the knee. Thereupon the surgeon repeated the amputation higher up. Healthy cicatrisation took place; but ere long pain, as bad as at first, returned in the new stump. The next proceeding was to excise a large portion of the sacro-sciatic nerve. But this operation had no better result than the preceding. Neither surgeon nor patient, however, lost heart. As there still remained a portion of limb capable of removal, amputation at the hip-joint was performed. The large wound healed favourably. Yet the pain did not depart; it continued in the cicatrix as great as ever, and of the same kind as at first. The young woman was eventually sent to the sea-side. There she became pregnant. Upon her return it was ascertained that as soon as she felt herself in the family-way, the neuralgia ceased. Having subsequently become the mother of a large family, she has been frequently seen on account of her children; and according to her statement, she has still occasional attacks of the old pain in the stump.

The writer has been informed of a similar case which occurred recently. The surgeon was induced, chiefly by the solicitations of the patient, a woman of hysterical temperament, to amputate her limb for supposed ulceration of the cartilages of the knee-joint. The structures were found healthy.

It is not uncommon for hysterical patients, especially those who have been long confined to the recumbent position, to lose control over their lower extremities—to have 'hysterical paraplegia.' When neuralgia of the spine is added, the complication no doubt increases the difficulty of diagnosis. It will, however, be perceived further on, that when paraplegia occurs as the result of carious ulceration, it is preceded by strikingly marked angular deformity of the column; a condition that does not belong to neuralgia. Yet, in certain rare cases, deformity may not be wanting to increase the perplexity.

The writer had under his charge a governess, twenty-two years of age, affected with paraplegia; she suffered at the same time from neuralgia in the spine. On examining the seat of the pain, which was in the lumbar region, a projection of some of the vertebræ was distinctly visible. The patient had been obliged to relinquish her situation in a family, as it had been stated by the medical attendant that she had spinal disease, accompanied with affection of the spinal cord. From inquiry, however, into the history of the deformity and examination of the whole spine, it was made out satisfactorily that the bulging of the spine at the loins, was a consequence merely of lateral distortion; that the pain situated there was nervous; and that the dragging of the limbs and inability to walk were symptoms of hysterical paraplegia. Under treatment by physical exercises, shampooing, shower baths, tonics, &c., she perfectly recovered in a few weeks.*

Angular Deformity.

When the substance of one or more bodies of the vertebræ has been removed by caries, it may easily be understood that, from the superimposed portion having been undermined, it will fall forward and form an angle with that below. The pressure of the superincumbent weight, however, is not the only agent in producing the bend; when a patient is confined strictly to the recumbent position, the angle continues to become more acute, which shows that the action of the abdominal muscles shares in causing the deformity.

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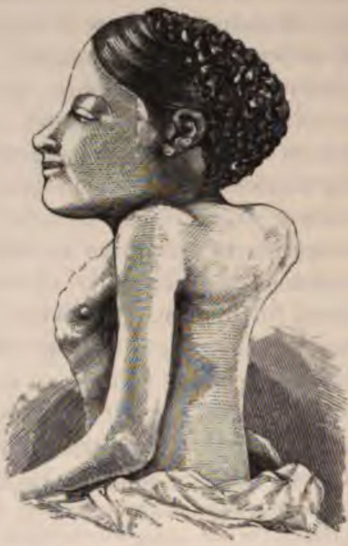
* See article Hysteria, vol. i. p. 379. *Lectures on Local Nervous Affections,* by Sir B. C. Brodie. Also a masterly essay *On the Moral Constitution in Females of Hysterical Diathesis,* by Dr. Robert Ferguson, prefixed to Dr. Gooch's Works, published by the New Sydenham Society.

FIG. 219.*



From the bodies and fibro-cartilages in which the loss of substance takes place, being in the median line, the descent of the upper portion is generally in a direction straight forwards. That, at least, is invariably the case in the dorsal region. But in the dorsi-lumbar and lumbar regions, at which greater latitude of motion exists, a lateral deviation will sometimes be combined with the movement forward. The surgeon may be deceived by that inclination to one side; and commit the dangerous error of supposing a case of angular deformity to be one of lateral distortion.

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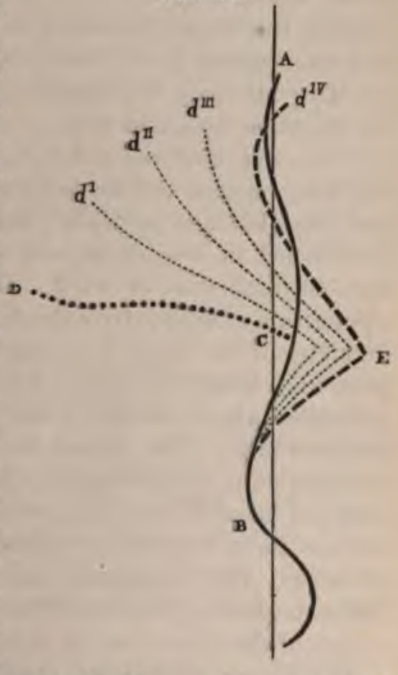
* The figure, copied from a photograph, shows the appearances commonly presented in a case of angular deformity from spinal disease. The patient, a delicate girl, fourteen years of age, had become deformed to the extent seen in the drawing, shortly before her admission into the hospital. She had been generally able to go about and attend school, during the progress of the deformity. Latterly, she failed in her power of walking. But it was ascertained by frequent observation that this defect did not proceed from paraplegia; but only from inability to balance herself in the newly-deformed condition of the upper region of her body. She became strong on her limbs, after a short stay in the hospital.

The writer was consulted about a girl, aged fifteen, who had a projection at the dorsi-lumbar region, with a distinctly-marked deviation of the spine to one side, simulating closely lateral curvature. The medical attendant had considered the case to be of that kind, and put the patient on a course of calisthenic exercises. It was distinctly ascertained, however, that the prominence was the effect of caries; and the principal diagnostic sign was the directness with which the spinous processes stood out backwardly, against the skin; for it is a never-failing observation in regard to lateral distortion, that, owing to the rotation of the column on its long axis, which always accompanies incurvation, the spinous processes are pointed laterally, toward the concavity; and that to such a degree that they are nearly hidden from view by the overlapping of the edge of the longissimus dorsi.

But angular deformity does not consist merely in a falling forward of the undermined portion of the spine, while the inferior remains erect. It is not the same as when a rigid pole, like a flagstaff, is broken by the wind, and the upper part falls over. Were that the case, a patient in whom the spine had become bent would not be able to preserve his equilibrium; his head would be thrown inordinately in front of the line of gravity, and if he attempted to walk, he would be precipitated forward. When a person, therefore, has spinal disease, yet is able to be upon his legs, he is instinctively led to make certain efforts for restoring the balance; the nature of which the accompanying diagram is intended to illustrate. In his first endeavours, he grasps both thighs above the knees with his hands, thus making supports of his arms; he tries at the same time both to elevate the head, and to carry the upper part of the body back, obviously

Fig. 220.*



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* A. B. Spine in profile. C. Seat of disease. C. D. Upper portion fallen forward, $d^{I.}$ $d^{II.}$ $d^{III.}$ $d^{IV.}$ upper portion both elevated and carried back to the line of the centre of gravity. E. Apex of angle moved backward.

with the design of bringing them more directly into the centre of gravity. Eventually he succeeds; and it is obviously by causing the portions of the column above and below the angle to arch backward. But these incurvations will have the effect of carrying the angle itself also backward. Hence the prominent 'hump,' which is such a conspicuous feature in the deformity from spinal disease, is produced. It may also be perceived that the apparently proud air with which the patient carries himself—his face turned upward and his body thrown back—is merely an effect of his continued efforts to restore the head to its proper vertical position above the base of the spine. When the disease is in the lumbar vertebræ, and a deep chasm is formed just at the base, the column falls down in its whole length; there are therefore no means of transporting the angle backward in the manner described above; and the patient is in the pitiable condition of being obliged to carry his body horizontally, *ventre à terre*, progressing on his knees, or feet, and hands.

Changes in chest and abdomen.—When the disease is seated in the dorsal region the whole thorax is included in the deformity, and the abdomen partially; the trunk being at the same time diminished in height, as well as rendered broad and square, without distinction of waist. Owing to the falling forward of the portion of spine above the diseased part, the antero-posterior diameter of the chest is increased in length; the sternum also protrudes, being sometimes bent at an obtuse angle; and the projection there forms a kind of counterpoise to the posterior protuberance. The viscera both of the thorax and abdomen accommodate themselves, by alterations in their forms, to the changed condition of the walls of their respective cavities, neither their internal structure nor their functions appearing to suffer. The œsophagus and trachea are simply shortened; the aorta, having to give off its intercostal branches, follows the course of the spine, and is, therefore, about its natural length.

The disease sometimes attacks two different parts of the column, either at once, or at distinct periods; thereby causing two angular projections of the spine in the same patient. In the last case witnessed by the writer, the boy had just recovered from disease in the dorsi-lumbar region, when it appeared in the cervico-dorsal vertebræ; there it extended to the spinal cord, and the patient died in a few months with paraplegia.

Spinal Abscess.

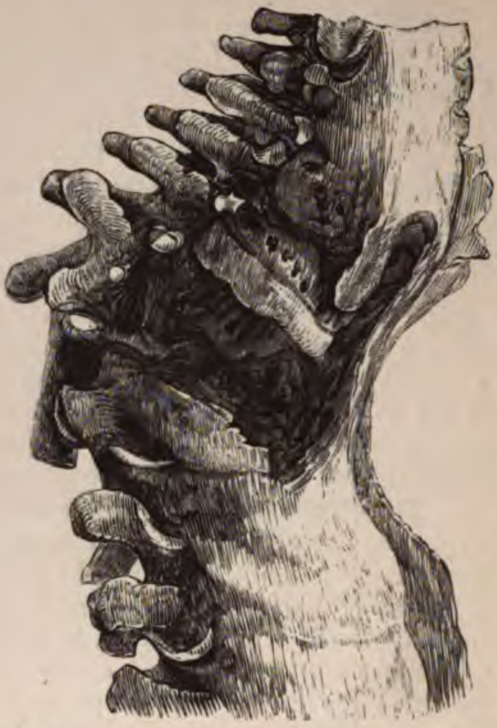
The importance of the subject of abscesses connected with disease of the spine, may be judged of when it is stated that they are the most frequent causes of death, in this complaint. Yet happily in a large number of cases the disease runs its whole course, producing extreme deformity, and ending in anchylosis, without evidence of any abscess having formed.

It has been shown above that the destructive effects of spinal disease are confined to the anterior segment of the column; and that while the morbid processes are committing extensive ravages there, an opposite reparative or defensive action is going on in the posterior segment. Now, the different courses followed by spinal abscesses cannot be properly understood unless the influence of these distinct agencies be kept in view.

And here a remark concerning the constitution of abscesses generally may not be out of place. It belongs to all abscesses to have an element of self-cure as well as of increase. In the walls of a simple abscess two different processes are observed to be going on. The deeply-seated part of the parietes carries on a formative action, opposed in its nature to an absorptive one in the more superficial part. And it is by the concurrent growth at the bottom or basis, and removal and thinning of the structures toward the point of acumination, that the contents are eventually brought to the surface and discharged. On the pus being evacuated the cavity is filled up by granulations springing from the under surface, on the same principle as a wound is healed by the second intention. When the abscess is cured by resolution, it is from the adhesive, formative, or reparative process overcoming the suppurative and absorptive. The pus is then taken up and carried into the system; the walls proportionately thicken by new growth till they close in and obliterate the cavity.

The mode in which an abscess is first formed, in disease of the spine, appears to be as follows. The morbid process being a species of ulceration, the act of removal of substance is accompanied with suppuration. In an ordinary ulcer, say of the skin or mucous membrane, the pus thus discharged is either collected under the dressings or washed away. But in the spine the matter is caught by the connecting tissue; that becomes thickened and condensed; and at length an abscess, with proper pyogenic membrane, is constructed. When a collection of pus is thus formed, various causes may lead to its progressive increase. From the denudation of the bone and fibro-cartilages, and the exposure of their surfaces to the pus, the ulceration may be expected to spread. Owing to the natural flexibility of the spine, the attri-

FIG. 221.*



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* The patient from whom the specimen represented in the figure was removed, was a blacksmith, twenty-eight years of age, and was admitted into the hospital for a psoas abscess, about the size of a large orange, situated in the left groin. He had an abrupt angular deformity in the back with protuberance of the sternum; and his muscles, particularly those of the upper extremities, were largely developed. The deformity had taken place when he was fourteen years of age; and it had not increased since. His father being a blacksmith, he had been early put to the same work, and had continued uninterruptedly at it till three weeks before his admission, when he first noticed the swelling in the groin. On the abscess being tapped, a straw-coloured fluid was discharged; the opening did not heal; ordinary pus continued to flow; and he died exhausted with hectic fever. It will be remarked in the figure, that the posterior arches and articular processes of the vertebræ, at the seat of disease, have been firmly united together by bone.

tion between the opposing diseased surfaces will be great; but it will be made worse by the additional mobility consequent on the destruction of the fibro-cartilages and other ligaments which connect the vertebræ. Again, in proportion as the excavation proceeds, and the spine becomes more bent, all the adjacent structures in front of the column will become further relaxed, and so facilitate the accumulation of pus in the abscess.

Yet experience shows, as already remarked, that in a large number of cases the disease proceeds to the effect of producing extreme deformity, even combined with paraplegia, without any signs of abscess presenting themselves. But it is not to be concluded on that account that abscess has not existed in these cases. Owing to the inaccessible situation of the diseased parts, a collection of matter may have formed in connection with the carious vertebræ, and its presence would not be known if it remained of small size. An abscess, therefore, arrested in its progress before becoming sufficiently large to show itself outwardly, might have been lodged for an indefinite length of time in the angle of the diseased bones, and been eventually removed by resolution, without its existence having been suspected.

Let it therefore be asked, under what conditions it may be expected that an abscess in course of formation, in contact with diseased vertebræ and fibro-cartilages, may be arrested in its progress and dispersed? That inquiry introduces the subject of anchylosis.

Anchylosis.—When inflammation of the adhesive type affects a bone, the first change observed is a thickening of the periosteum, extending more or less to the connecting tissue around; by that means the adjoining structures are agglutinated and a bed prepared for the deposit of ossific matter. As stated before (supra, p. 105), one of the consequences of caries attacking the bodies of the vertebræ is, that adhesive inflammation is set up in the posterior segments of the bones. It may therefore be assumed that shortly after the commencement of the disease, the connecting tissue in the interstices of the vertebræ behind, will be consolidated, and by taking on the office of additional ligaments, will bind the arches and different processes together. The immediate effect of this cohesion of several vertebræ will be, to diminish, if not altogether stop, the jarring and friction between the diseased surfaces, which tend so greatly to aggravate the morbid action. An incipient abscess will, therefore, be in a comparatively more favourable condition for undergoing cure by resolution. Accordingly, it may be supposed that the diseased process will sooner or later cease; that the abscess will be obliterated; and that the confronting surfaces of the partially destroyed vertebræ will come into apposition. The consolidated posterior segment will preserve the vertebræ at rest, like splints applied to a fractured bone; the surfaces may therefore be expected to unite; with, perhaps, remnants of the bodies of several adjoining vertebræ all fused into one. Such is a description of *true* anchylosis.

Spurious anchylosis.—This term is applied in reference to the joints in general, to that kind of union between the surfaces, after disease, in which the bond consists either wholly of fibrous structure, or of that combined with osseous matter. In the spine it denotes that the posterior surfaces of the vertebræ alone, including the laminæ and various processes, are soldered by bone, while the surfaces of the bodies, partially consumed by the caries, are apart; and are connected above and below by the remains only of the walls of the obliterated abscess.

The writer had an opportunity of exhibiting, at a meeting of the Pathological Society,* a series of five different specimens of vertebræ united by bone after caries, and in which the anchylosis was partial. The appearances were essentially the same in all. Down the whole length of the posterior segments of the affected vertebræ, perfectly solid ossific union could be traced between the margins of the laminæ and the oblique processes, including their articular surfaces: and it was so firm and general, that all mobility was destroyed. But no similar union had taken place on the fore part. The bodies had been destroyed to different degrees, and gaps of various width separated them; so that the continuity of the spine as a column, depended wholly at the diseased part on the posterior segment. The amount of separation between the surfaces of the bodies, was owing to two distinct causes; in some of the specimens, the distance at which the surfaces were apart was to be accounted for principally by the quantity of substance lost through the carious ulceration; in others, it was obviously consequent mainly on the too great obtuseness of the angle at the seat of flexion, and the inability of the surfaces, from the spine having become fixed, to approach closer to each other.

The importance, in a practical view, of keeping this distinction between the two forms of anchylosis in mind is obvious.

1. It bears on the question, as to which position of the spine, during the treatment, is most favourable for obtaining solid union between the surfaces at the close of the disease. The friends

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* *Path. Trans.* vol. i. p. 328.

of a young patient are naturally much distressed when they see the rapidity with which the spine becomes bent, and they would fain induce the surgeon to employ measures to keep the column straight. They are not aware that a certain amount of deformity is a necessary condition of cure in this dangerous disease. Loss of substance in the fore part of the column is inevitable: the destroyed portion cannot be replaced: the only way by which a cure can be effected, is by the upper and lower portions coming into apposition, and uniting as a broken bone would do; but that approximation and union can only take place by the spine becoming bent at an angle more or less acute. Hence, even if the treatment by extension were safe—which it is not—a sufficient argument against it would be, that in the event of its being carried out, the only union obtained would be in the posterior segment, and a permanent gap would be left in front.

2. It is sometimes advantageous for the surgeon to be acquainted with the proceedings of quacks. Bone-setters and others frequently undertake to straighten the spine in cases of angular deformity; and as they occasionally have a certain temporary success which gains them reputation, it is more necessary to understand what they do, and at what a risk. They will take, for example, a young man who has a prominent hump in the dorsal region, consequent on disease which he may have had in childhood. By confining him in the recumbent position, employing mechanical means to stretch the back, and putting him on physical exercises, not forgetting to manipulate the projecting vertebræ sufficiently often, the spine may be made straighter, and the hump less distinct.* The quack will probably represent that the cure has been effected by his reducing the dislocated bones at the angular projection. But it is obvious that the apparent improvement has been brought about wholly by the extension of the sound portions of the spine above and below the apex of the angle. Each of these portions, besides being inclined from before backward, is curved; and it can be easily understood that, by restoring them to a vertical line, the whole column will be rendered straighter, and the protuberance less distinct. But it is not

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* See a series of casts taken from patients who had undergone treatment by mechanical extension for angular deformity, contained in the Museum of the Middlesex Hospital.

diaphragm and gained its abdominal side, it comes into relation with the heads of the psoas muscle. That muscle arises by one set of fibres from the sides of the bodies of the vertebræ, by another from the roots of the transverse processes: and stretched across both origins in front, are the ligamenta arcuata. As the abscess, therefore, travels downwards, it has to pass through a narrow strait; it is prevented from enlarging on the fore part, by the resistance of the ligamenta arcuata, and at the back, by that of the spine and lowest rib; hence, in order to proceed it has to force its way in the line of the psoas muscle. That, however, can only be done by penetrating into its interior. It accomplishes this, in the first place, by inserting its most advanced part, like a wedge, between the two origins; it then splits and distends the fibres, so as to form a cavity for the reception of the pus; the muscular fibres become incorporated with the walls of the abscess; and the psoas at length is converted, more or less thoroughly, into an abscess. But the muscle charged with pus does not expand equally in every direction. The fascia iliaca forms a kind of sheath for it; and this, being particularly strong on the inner side and united firmly to the brim of the true pelvis, prevents the growth of the abscess inwardly. On the outer side, however, the connections are loose; and there enlargement takes place freely. The abscess now chiefly occupies the hollow between the united fibres of the iliacus internus and psoas muscles on the inside, and the crest of the ilium on the outside. When the advanced part reaches the level of Poupart's ligament, a certain retardation occurs; and then a bulging will be observed along the line of the flexure of the groin. The abscess now perforates the abdominal walls in the same way as it formerly did the diaphragm. And the opening is invariably at one place: namely, behind Poupart's ligament, between the united tendons of the iliacus internus and psoas muscles, and the anterior inferior spinous process of the ilium. The situation corresponds to the point of junction of the outer with the middle third of Poupart's ligament.

Before the protrusion takes place, there will be a certain amount of thickening and condensation of the connecting tissue in the groin—a consequence of the inflammation excited by the near approach of the abscess—and a provision at the same time for strengthening its walls when it does emerge. On the abscess actually escaping, it will be suddenly relieved from a considerable compression to which it had been subjected in the interior; and it is from that cause probably that it increases rapidly in size as soon as it appears outwardly. The enlargement is sometimes greatest in the groin, and for a short way down. But it is more common for the abscess to descend for some distance on the thigh; and the direction then varies. Owing to the walls abutting at the commencement of its course against the origins of the sartorius and tensor vaginæ femoris, and their opposing its progress outwardly, the line which it most frequently takes is inward and downward, along the sartorius; and it often accompanies that muscle to near the knee. Sometimes, however, soon after its appearance in the groin, it turns sharply inwards to occupy a space over the adductor muscles. In a comparatively rare set of cases it bends outwardly. The least frequent direction is straight downwards. Occasionally, the abscess divides at the groin; one portion going inwardly and the other outwardly.

'Neck' of the abscess.—It seems appropriate, on the analogy of hernia, to call the narrow part of the abscess where it passes through the abdominal parietes, its 'neck.' It may be true that, when an abscess has been formed in the thigh, consequent on matter descending from a diseased portion of the spine, it is free, like others arising differently, to secrete additional pus from its own pyogenic membrane, or to absorb it; yet it would appear that abscesses originally spinal, are mainly dependent on the parent one. Now, the channel of communication between the well from which the fluid is drawn, and the sac or reservoir below, is constricted at the neck more than elsewhere. It will depend, therefore, greatly on the width of that aperture as to whether the abscess in the thigh be abundantly or sparingly replenished from above. In general there is a disposition in the opening to contract: although it has never, according to the writer's knowledge, become entirely closed. The degree to which the narrowing has gone, will commonly be judged of pretty accurately by the feel of the parts when the contents of the abscess have been squeezed upwards, and then when uncompressed, and comparing them with the condition of the corresponding parts on the sound side. Occasionally both the neck and the channel leading from it to the abscess are constricted to such a degree that no traces of them can be found: the collection appears circumscribed; and a question arises as to whether it be really connected with the spine. The surgeon

may, therefore, have recourse to another mode of examination; if he bandages the abscess firmly for a few days, it will be seen to have had the effect of reducing the swelling considerably in size; let him next leave the abscess without bandages, and permit the patient to be in the upright position; he will soon find that the swelling has returned to its original dimensions—thus showing that the channel was pervious, and that the pus could be passed along it, to and fro.

Lumbar abscess.—It was stated formerly, when describing the process by which a spinal abscess, originating in the dorsal region, made its way through the diaphragm, that the passage was effected through a narrow opening, bounded in front and outwardly by the ligamenta arcuata, behind by the lowest rib, and on the inside by the bodies of the vertebræ; and it was added, that the abscess continued its descent by penetrating the psoas muscle. At the point where this obstruction is met with, and where the ribs cease to form an obstacle to the passage of the abscess backward, it occasionally perforates the abdominal parietes, and presents itself in the loins as a 'lumbar' abscess. In some cases the whole abscess takes that route, but in others only a part; so that the lumbar is merely an offshoot of a psoas abscess. Again, a lumbar abscess may be in connection with diseased upper lumbar vertebræ; just as may be the case with a psoas abscess. The lumbar abscess perforates the quadratus lumborum, and it appears under the skin on the outside of the sacro-lumbalis muscle. In its progress posteriorly the abscess meets with opposition from various dense fasciæ and tendinous expansions; which deflect its walls, and cause it to assume outwardly a broad and flat appearance, with slight elevation.

Spinal abscess in the neck.—Disease affecting the articulations between the two uppermost vertebræ of the neck, the atlas and axis, is characterised by certain peculiarities which entitle it to be treated of separately; its consideration will, therefore, be postponed to the end of the article. When any of the inferior cervical vertebræ are the subjects of caries, a collection of pus will form on their fore part, as in the spine generally: but instead of the matter accumulating there, and forming a prominent swelling which might compress the trachea or œsophagus, or dropping downwards, it is deflected laterally. Hence the abscess appears outwardly on one or both sides of the neck inclining somewhat posteriorly.

Varieties in spinal abscesses.—It is proper to mention some exceptions or anomalies met with in abscesses in different parts of the spine.

1. In describing the first stage of the formation of psoas abscess, it was stated that the sac occasionally bifurcated; one branch descending along one side of the bodies of the vertebræ, and the other along the other. Cases in which both have arrived and pointed at the groin are extremely rare. Dissection sometimes reveals the fact, not ascertained during life, that while an abscess, on one side, ran its whole course and discharged its contents on the thigh, another, on the opposite side, stopped short about midway. In every case an examination ought to be made to ascertain whether there be two abscesses or only one.

2. It is not uncommon, in a case of psoas abscess, for the collection of pus to be arrested in its progress downwards, just above Poupart's ligament, or when it is lying on the venter ilii. It may then increase in size and become a prominent, globular swelling, with distinctly defined boundaries.

A young girl, fourteen years of age, had disease in two or more of the central dorsal vertebræ; it had caused great angular deformity, and for a certain period, paraplegia; at length, a globular swelling, visible to the eye, formed in the right iliac region. After remaining stationary for a short time, it began to diminish; then it got gradually smaller, till, after the lapse of several months, it had entirely disappeared, so that no trace of it could be found. The local treatment consisted in the continued application of the tincture of iodine. Eventually the patient's health was quite restored; the deformity alone remaining.

3. When a spinal abscess, in descending, reaches the hollow of the ilium, instead of pursuing its course downwards, it occasionally turns sideways, mounts over the crest of the ilium, and discharges its contents, by one or more openings, over the glutei muscles. The same thing is sometimes met with in connection with lumbar abscess. The occurrence is more frequent in children than in adults: a difference which may be accounted for by the relatively small size of the pelvis in the former.

4. Sir B. C. Brodie has described certain cases in which part of the contents of a psoas abscess, when lying in the iliac region above Poupart's ligament, has made its way into the spermatic canal, and so appeared at the external abdominal ring, like an inguinal hernia.*

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* *On Diseases of the Joints*, p. 267.

The writer has witnessed a similar case, in which the tumour had some resemblance to a reducible hernia. Along the flexure of the groin, and for some distance above, there was general fulness and induration of the structures. At the external abdominal ring, and for a short distance below, in the line of the spermatic cord, there was a circumscribed swelling, which became more prominent when the patient coughed. The contents of the supposed sac, however, were quite soft and compressible. The man was not aware that he had disease of the spine, having come to the hospital for some comparatively trivial complaint. On turning to the back, there was an absence of any distinct projection of the spinous processes; all that could be perceived was a slight arching backward of the vertebræ in the lumbar region, which was in contrast with the hollow naturally existing there. The chief diagnostic symptoms were, well-marked rigidity of the column at the loins, and natural flexibility elsewhere. Shortly after his admission he rapidly got worse; the abscess in the groin broke; and on his death, the bodies of three lumbar vertebræ were found carious and surrounded by pus.*

5. *Contents of spinal abscess discharged by the lungs.*—It has been already stated that when abscess forms behind the posterior mediastinum in connection with diseased dorsal vertebræ, it is generally prevented, by the bending and receding of the spine, as well as by the cavity emptying itself downwards, from enlarging to such a degree as to press on the roots of the lungs and impede their functions. But a danger of another kind is to be apprehended from the proximity of the collection of pus to the lungs: inflammation is apt to spread from the pleura costalis, which covers the walls of the abscess, to the pleura pulmonalis and substance of the lungs: pleurisy or pneumonia, or both combined, may then be excited, and death may ensue. A different result, however, may be looked for, in a few exceptional cases: namely, the evacuation of the abscess through the lungs. The process by which that is effected is the same that has been described in explaining how an abscess perforates the diaphragm in passing from the thoracic into the abdominal region. It is the same also as the process by which an abscess of the liver discharges its contents through the lungs. Firm adhesion is first established between the walls of the abscess and the surface of the lungs; next, in some central part within the area of these adhering structures, an opening by absorption is made, having the margins secured by the surrounding adhesion; this opening brings the interior of the abscess into communication with lung substance, which becomes condensed in the neighbourhood; a tunnelling is commenced through the latter until

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* See preparation in the Museum of the Middlesex Hospital.

a large bronchial tube has been reached and opened; then the pus is coughed up and expectorated.

The writer was consulted in the case of a boy affected with angular deformity, the apex being formed by the spinous processes of the fourth and fifth dorsal vertebræ. He had been confined to bed at the commencement of the disease, five years before; he had since then been strong and active; and the object of the consultation was merely to ascertain whether anything could be done to improve his figure. During the interview, the patient took from his pocket a small box containing fragments of bone; and these he said he had coughed up, together with a large quantity of matter, when his illness was at the worst. The structure of the pieces resembled that of the bodies of vertebræ; they were generally cancellous; but had here and there portions of cortical layers upon them; they were four in number, irregularly cube-shaped, the sides measuring, on an average, from three to four lines. It was supposed that they had lain loose in an abscess at the seat of the deformity, and been expectorated.

6. *Abscess opening into intestine.*—It is not uncommon for abscesses in the abdominal region, with whatever viscus they may be connected, to empty themselves into some part of the intestinal canal if they come into contact with it. For example, abscess of the liver frequently terminates in that way.

The following is a brief notice of a case in which a spinal abscess communicated with a portion of intestine, and in which not only did the matter of the abscess pass into the bowel, but the contents of the bowel discharged themselves by the abscess. The patient was a girl, thirteen years of age, who had acute angular deformity at the centre of the dorsal vertebræ, and a psoas abscess of several months' duration on the left side. The abscess reached down to the knee; the external opening being over the inner condyle of the femur. As a proof that the abscess admitted some of the contents of the intestines into its interior, the patient, during the writer's visit, picked from the orifice the skins of one or two peas, and a bit of undigested stalk of greens, which she had been lately eating.

7. *Spinal abscess discharging its contents by the urinary bladder.*—

An under gardener, twenty-four years of age, had angular deformity; the most prominent spinous process being that of the seventh dorsal vertebra. He could not tell when the disease began; and as he had never missed a day's work on account of it, he had reluctantly left his situation to become a patient. By carrying the fingers deeply in the direction of the psoas muscle, a large abscess could be distinctly felt. He remained in the hospital two months, during which no perceptible change occurred. At the end of six months he returned; having worked at the spade the greater part of the intervening time. He stated that a week before, he had slight trouble in passing his water; and shortly afterwards, he voided a large quantity of matter of a yellow colour, along with the urine. That he had continued to do to be expected that the improvement will last. As no change can be made in the relations of the vertebræ at the seat of anchylosis, and their surfaces, in conformity with the angle they form, are placed obliquely, the longitudinal axis of the upper and lower portions respectively must likewise be bent in reference to each other. Hence the spine will soon return to its former condition. But it is the danger of the treatment which constitutes the chief objection. And that arises from its being impossible to know beforehand what is the exact kind and degree of union that may have taken place at the seat of disease, or what may be the state of the abscess. If the cavity of the abscess has been obliterated, and the former communication between it and the carious bodies closed, and if the anchylosis has been perfect, so that no remnant of the disease has been left, the treatment, however rough, might do no harm, if it did no good. But the results would be disastrous, if the anchylosis were spurious, and the walls of the abscess were the only connection between the upper and lower portions in front. Owing to the union between the vertebræ at the back, the mobility would be destroyed, and it might be inferred that the anchylosis was perfect; yet the osseous bond might not be sufficiently strong to resist the violence sometimes employed in endeavouring to straighten the spine, by ignorant practitioners.

A friend related to the writer the following case, and also showed him the preparation connected with it. A young woman had caries of the lower cervical and upper dorsal vertebræ, from which she recovered, so as to be able to resume her employment. The angular deformity being considerable, she applied to a quack, who promised to make the spine straight. The treatment consisted chiefly in employing mechanical means to stretch the neck. While increasing the power one day, there was an audible snap, with sudden pain. The patient was found immediately afterwards paralysed from the neck downwards, and in a few days she died. It was found at the post-mortem examination, that there was an abscess, nearly obliterated, in front of carious vertebræ; and that the walls of the abscess had been extensively torn from their connections with the bones. The spinal cord was diffluent near the seat of injury. It cannot be doubted that, when the force of extension was increased and the snap heard, the bony connections of the posterior segment of the vertebræ had been broken, the walls of the abscess detached from the bodies in front, and the spinal cord ruptured.

Psoas and Lumbar Abscess.

The abscesses hitherto treated of have been supposed to have stopped growing before they attained a large size; they have remained dormant, or been removed by absorption. The next to be considered are those which have progressively enlarged, and travelled long distances to evacuate their contents externally. Owing to the great dimensions which the latter commonly acquire, and to their cavities communicating with the vertebræ while still in a state of disease, they are especially dangerous in their consequences; they are, indeed, the most frequent causes of death in spinal disease.

A spinal abscess, at its commencement, lies upon the carious vertebræ, filling up the angle in front. It is favoured in taking that position by the bend in the column which has the effect of relaxing the structures on the fore part, and facilitating the accumulation of fluid. For the same reason abscesses will sometimes increase to a large size in the dorsal region without producing undue pressure on the roots of the lungs. As the pus accumulates, it is prevented by the portion of spine which forms the upper side of the angle overhanging it, from ascending; it cannot proceed backwards, owing to the thickness of the structures;* it would be difficult for it to make its way down the front of the bodies: accordingly, the ordinary course which an abscess takes when it enlarges is downward, by the sides of the bodies of the vertebræ. Sometimes the main sac bifurcates, one branch descending along the right and the other along the left side. In the thorax, the walls of the abscess are covered in front by the costal pleura; in the abdominal region, by the parietal peritonæum. When the abscess is connected with diseased dorsal vertebræ, it encounters in its descent the diaphragm. But that barrier is overcome by a particular process. As the abscess comes into contact with the diaphragm and compresses it, adhesive inflammation is set up in their respective surfaces; the consequence is, that they become united over a considerable area; an opening is next formed by absorption within the boundaries of the adhering structures; the abscess then protrudes; and extravasation of pus at the margins is prevented from taking place by the firm union of the parts encircling the opening.

Psoas abscess.—When the abscess has thus perforated the diaphragm and gained its abdominal side, it comes into relation with the heads of the psoas muscle. That muscle arises by one set of fibres from the sides of the bodies of the vertebræ, by another from the roots of the transverse processes: and stretched across both origins in front, are the ligamenta arcuata. As the abscess, therefore, travels downwards, it has to pass through a narrow strait; it is prevented from enlarging on the fore part, by the resistance of the ligamenta arcuata, and at the back, by that of the spine and lowest rib; hence, in order to proceed it has to force its way in the line of the psoas muscle. That, however, can only be done by penetrating into its interior. It accomplishes this, in the first place, by inserting its most advanced part, like a wedge, between the two origins; it then splits and distends the fibres, so as to form a cavity for the reception of the pus; the muscular fibres become incorporated with the walls of the abscess; and the psoas at length is converted, more or less thoroughly, into an abscess. But the muscle charged with pus does not expand equally in every direction. The fascia iliaca forms a kind of sheath for it; and this, being particularly strong on the inner side and united firmly to the brim of the true pelvis, prevents the growth of the abscess inwardly. On the outer side, however, the connections are loose; and there enlargement takes place freely. The abscess now chiefly occupies the hollow between the united fibres of the iliacus internus and psoas muscles, on the inside, and the crest of the ilium on the outside. When the advanced part reaches the level of Poupart's ligament, a certain retardation occurs; and then a bulging will be observed along the line of the flexure of the groin. The abscess now perforates the abdominal walls in the same way as it formerly did the diaphragm. And the opening is invariably at one place: namely, behind Poupart's ligament, between the united tendons of the iliacus internus and psoas muscles, and the anterior inferior spinous process of the ilium. The situation corresponds to the point of junction of the outer with the middle third of Poupart's ligament.

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* The writer does not remember more than one case in which a spinal abscess in the dorsal region opened directly backwards. There were two orifices near the projecting angle. The pus flowing from them had bubbles of air mixed with it; and it was noticed that these were drawn within the openings in inspiration, and expelled in expiration.

Before the protrusion takes place, there will be a certain amount of thickening and condensation of the connecting tissue in the groin—a consequence of the inflammation excited by the near approach of the abscess—and a provision at the same time for strengthening its walls when it does emerge. On the abscess actually escaping, it will be suddenly relieved from a considerable compression to which it had been subjected in the interior; and it is from that cause probably that it increases rapidly in size as soon as it appears outwardly. The enlargement is sometimes greatest in the groin, and for a short way down. But it is more common for the abscess to descend for some distance on the thigh; and the direction then varies. Owing to the walls abutting at the commencement of its course against the origins of the sartorius and tensor vaginæ femoris, and their opposing its progress outwardly, the line which it most frequently takes is inward and downward, along the sartorius; and it often accompanies that muscle to near the knee. Sometimes, however, soon after its appearance in the groin, it turns sharply inwards to occupy a space over the adductor muscles. In a comparatively rare set of cases it bends outwardly. The least frequent direction is straight downwards. Occasionally, the abscess divides at the groin; one portion going inwardly and the other outwardly.

'Neck' of the abscess.—It seems appropriate, on the analogy of hernia, to call the narrow part of the abscess where it passes through the abdominal parietes, its 'neck.' It may be true that, when an abscess has been formed in the thigh, consequent on matter descending from a diseased portion of the spine, it is free, like others arising differently, to secrete additional pus from its own pyogenic membrane, or to absorb it; yet it would appear that abscesses originally spinal, are mainly dependent on the parent one. Now, the channel of communication between the well from which the fluid is drawn, and the sac or reservoir below, is constricted at the neck more than elsewhere. It will depend, therefore, greatly on the width of that aperture as to whether the abscess in the thigh be abundantly or sparingly replenished from above. In general there is a disposition in the opening to contract: although it has never, according to the writer's knowledge, become entirely closed. The degree to which the narrowing has gone, will commonly be judged of pretty accurately by the feel of the parts when the contents of the abscess have been squeezed upwards, and then when uncompressed, and comparing them with the condition of the corresponding parts on the sound side. Occasionally both the neck and the channel leading from it to the abscess are constricted to such a degree that no traces of them can be found: the collection appears circumscribed; and a question arises as to whether it be really connected with the spine. The surgeon

may, therefore, have recourse to another mode of examination; if he bandages the abscess firmly for a few days, it will be seen to have had the effect of reducing the swelling considerably in size; let him next leave the abscess without bandages, and permit the patient to be in the upright position; he will soon find that the swelling has returned to its original dimensions —thus showing that the channel was pervious, and that the pus could be passed along it, to and fro.

Lumbar abscess.—It was stated formerly, when describing the process by which a spinal abscess, originating in the dorsal region, made its way through the diaphragm, that the passage was effected through a narrow opening, bounded in front and outwardly by the ligamenta arcuata, behind by the lowest rib, and on the inside by the bodies of the vertebræ; and it was added, that the abscess continued its descent by penetrating the psoas muscle. At the point where this obstruction is met with, and where the ribs cease to form an obstacle to the passage of the abscess backward, it occasionally perforates the abdominal parietes, and presents itself in the loins as a 'lumbar' abscess. In some cases the whole abscess takes that route, but in others only a part; so that the lumbar is merely an offshoot of a psoas abscess. Again, a lumbar abscess may be in connection with diseased upper lumbar vertebræ; just as may be the case with a psoas abscess. The lumbar abscess perforates the quadratus lumborum, and it appears under the skin on the outside of the sacro-lumbalis muscle. In its progress posteriorly the abscess meets with opposition from various dense fasciæ and tendinous expansions; which deflect its walls, and cause it to assume outwardly a broad and flat appearance, with slight elevation.

Spinal abscess in the neck.—Disease affecting the articulations between the two uppermost vertebræ of the neck, the atlas and axis, is characterised by certain peculiarities which entitle it to be treated of separately: its consideration will, therefore, be postponed to the end of the article. When any of the inferior cervical vertebræ are the subjects of caries, a collection of pus will form on their fore part, as in the spine generally: but instead of the matter accumulating there, and forming a prominent swelling which might compress the trachea or œsophagus, or dropping downwards, it is deflected laterally. Hence the abscess appears outwardly on one or both sides of the neck, inclining somewhat posteriorly.

Varieties in spinal abscesses.—It is proper to mention some exceptions or anomalies met with in abscesses in different parts of the spine.

1. In describing the first stage of the formation of psoas abscess, it was stated that the sac occasionally bifurcated; one branch descending along one side of the bodies of the vertebræ, and the other along the other. Cases in which both have arrived and pointed at the groin are extremely rare. Dissection sometimes reveals the fact, not ascertained during life, that while an abscess, on one side, ran its whole course and discharged its contents on the thigh, another, on the opposite side, stopped short about midway. In every case an examination ought to be made to ascertain whether there be two abscesses or only one.

2. It is not uncommon, in a case of psoas abscess, for the collection of pus to be arrested in its progress downwards, just above Poupart's ligament, or when it is lying on the venter ilii. It may then increase in size and become a prominent, globular swelling, with distinctly defined boundaries.

A young girl, fourteen years of age, had disease in two or more of the central dorsal vertebræ; it had caused great angular deformity, and for a certain period, paraplegia; at length, a globular swelling, visible to the eye, formed in the right iliac region. After remaining stationary for a short time, it began to diminish; then it got gradually smaller, till, after the lapse of several months, it had entirely disappeared, so that no trace of it could be found. The local treatment consisted in the continued application of the tincture of iodine. Eventually the patient's health was quite restored; the deformity alone remaining.

3. When a spinal abscess, in descending, reaches the hollow of the ilium, instead of pursuing its course downwards, it occasionally turns sideways, mounts over the crest of the ilium, and discharges its contents, by one or more openings, over the glutei muscles. The same thing is sometimes met with in connection with lumbar abscess. The occurrence is more frequent in children than in adults: a difference which may be accounted for by the relatively small size of the pelvis in the former.

4. Sir B. C. Brodie has described certain cases in which part of the contents of a psoas abscess, when lying in the iliac region above Poupart's ligament, has made its way into the spermatic canal, and so appeared at the external abdominal ring, like an inguinal hernia.*

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* *On Diseases of the Joints*, p. 267.

The writer has witnessed a similar case, in which the tumour had some r semblance to a reducible hernia. Along the flexure of the groin, and for son distance above, there was general fulness and induration of the structur At the external abdominal ring, and for a short distance below, in the line the spermatic cord, there was a circumscribed swelling, which became mo prominent when the patient coughed. The contents of the supposed sa however, were quite soft and compressible. The man was not aware th he had disease of the spine, having come to the hospital for some comparative trivial complaint. On turning to the back, there was an absence of any distin projection of the spinous processes; all that could be perceived was a slig arching backward of the vertebræ in the lumbar region, which was in contra with the hollow naturally existing there. The chief diagnostic symptoms we well-marked rigidity of the column at the loins, and natural flexibility els where. Shortly after his admission he rapidly got worse; the abscess in t groin broke; and on his death, the bodies of three lumbar vertebræ were fou carious and surrounded by pus.*

5. *Contents of spinal abscess discharged by the lungs.*—It ha been already stated that when abscess forms behind the po terior mediastinum in connection with diseased dorsal vertebr it is generally prevented, by the bending and receding of th spine, as well as by the cavity emptying itself downwards, fro enlarging to such a degree as to press on the roots of the lun and impede their functions. But a danger of another kind to be apprehended from the proximity of the collection of pus t the lungs: inflammation is apt to spread from the pleura costali which covers the walls of the abscess, to the pleura pulmonal and substance of the lungs: pleurisy or pneumonia, or bo combined, may then be excited, and death may ensue. different result, however, may be looked for, in a few exception cases: namely, the evacuation of the abscess through the lung The process by which that is effected is the same that has be described in explaining how an abscess perforates the diaphrag in passing from the thoracic into the abdominal region. It the same also as the process by which an abscess of the liv discharges its contents through the lungs. Firm adhesion first established between the walls of the abscess and the su face of the lungs; next, in some central part within the ar of these adhering structures, an opening by absorption is mad having the margins secured by the surrounding adhesion; th opening brings the interior of the abscess into communicati with lung substance, which becomes condensed in the neig bourhood; a tunnelling is commenced through the latter un

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* See preparation in the Museum of the Middlesex Hospital.

a large bronchial tube has been reached and opened; then the pus is coughed up and expectorated.

The writer was consulted in the case of a boy affected with angular deformity, the apex being formed by the spinous processes of the fourth and fifth dorsal vertebræ. He had been confined to bed at the commencement of the disease, five years before; he had since then been strong and active; and the object of the consultation was merely to ascertain whether anything could be done to improve his figure. During the interview, the patient took from his pocket a small box containing fragments of bone; and these he said he had coughed up, together with a large quantity of matter, when his illness was at the worst. The structure of the pieces resembled that of the bodies of vertebræ; they were generally cancellous; but had here and there portions of cortical layers upon them; they were four in number, irregularly cube-shaped, the sides measuring, on an average, from three to four lines. It was supposed that they had lain loose in an abscess at the seat of the deformity, and been expectorated.

6. *Abscess opening into intestine.*—It is not uncommon for abscesses in the abdominal region, with whatever viscus they may be connected, to empty themselves into some part of the intestinal canal if they come into contact with it. For example, abscess of the liver frequently terminates in that way.

The following is a brief notice of a case in which a spinal abscess communicated with a portion of intestine, and in which not only did the matter of the abscess pass into the bowel, but the contents of the bowel discharged themselves by the abscess. The patient was a girl, thirteen years of age, who had acute angular deformity at the centre of the dorsal vertebræ, and a psoas abscess of several months' duration on the left side. The abscess reached down to the knee; the external opening being over the inner condyle of the femur. As a proof that the abscess admitted some of the contents of the intestines into its interior, the patient, during the writer's visit, picked from the orifice the skins of one or two peas, and a bit of undigested stalk of greens, which she had been lately eating.

7. *Spinal abscess discharging its contents by the urinary bladder.*—

An under gardener, twenty-four years of age, had angular deformity; the most prominent spinous process being that of the seventh dorsal vertebra. He could not tell when the disease began; and as he had never missed a day's work on account of it, he had reluctantly left his situation to become a patient. By carrying the fingers deeply in the direction of the psoas muscle, a large abscess could be distinctly felt. He remained in the hospital two months, during which no perceptible change occurred. At the end of six months he returned; having worked at the spade the greater part of the intervening time. He stated that a week before, he had slight trouble in passing his water; and shortly afterwards, he voided a large quantity of matter of a yellow colour, along with the urine. That he had continued to do since; but latterly, the proportion of the pus to the urine had gradually diminished. During his stay in the hospital, about a third of what was passed consisted of pus. No trace of the abscess in the iliac region, which had been repeatedly felt before, was discernible. The patient left the hospital of his own accord, a fortnight after his readmission; and he could not be heard of afterwards.

Diagnosis of spinal abscess.—One of the most frequent causes of uncertainty in distinguishing abscesses connected with caries of the vertebræ from other swellings in the same locality, is the insidiousness with which spinal disease, as already stated, often commences and proceeds.

The following is an example, being that of a psoas abscess mistaken for a hernia. The patient was a young man, son of a large farmer, fond of hunting, and he had regularly followed the hounds till a few days before coming to town for consultation. He had observed, for a week, in his left groin, a swelling which his medical attendant told him was a rupture requiring a truss. In the flexure of the groin there was an oval tumour, of well-defined shape, and resembling a hernia, except in the point at which it emerged. It came out behind Poupart's ligament, an inch and a half externally to the part at which femoral hernia descends; in other words, it protruded at the place where psoas abscess appears when it passes out upon the thigh. Above the ligament, and in the iliac region generally, there were fulness and induration. On examining the back, no distinct protuberance of any of the spinous processes was visible. But in the loins, there was a perceptibly greater bulging backward of all the vertebræ than is natural, without undue prominence of any individual bone; the lumbar vertebræ were likewise abnormally rigid; the only free mobility being in the dorsi-lumbar region. The patient owned that, several months before, he had received an injury in the lower part of his back; but it was so slight that he had not given up any of his active pursuits for it. The dangerous nature of his illness was explained to him. He was loth, however, to forego his hunting. Ere long, the abscess enlarged, broke, and discharged a large quantity of pus. When last heard of, his recovery was deemed hopeless.

An abscess originating in caries of the lower lumbar vertebræ and extending it may be to the sacrum, is liable to spread laterally on the wing of the ilium, and to rise above the level of the crest. A swelling of that kind, if it be on the right, may be confounded with a cæcal abscess. Or if it surmount the crest and discharge its contents backward and downward, the movements of the hip will be disturbed; and it will be supposed to have originated in morbus coxæ. The diagnostic symptom most to be relied on in these doubtful cases, is the degree of flexibility observable in the lumbar region.

A tumour of medullary cancer is not unfrequently mistaken, according to its situation, for either a lumbar or psoas abscess.

The uncertainty will be increased if the cancer have invaded the spine, and by converting part of it into its own morbid structure, has caused the column to become bent. Again, it is the peculiar nature of this kind of carcinoma to throw out globular projections on the surface, resembling greatly the pointing of an abscess; moreover, the feeling of elastic resistance at the apices of these lobes, is so much like that of undulation of pus within an abscess, that a mistake in diagnosis is very apt to be made.*

The writer had lately under his care, in the hospital, a female, of middle age, who had lateral curvature of the spine, from girlhood; and in whom the hump was so prominent and abrupt, that it might be mistaken for angular deformity from caries of the vertebræ. She was admitted for a tumour that occupied the inner side of the left wing of the pelvis, and was on a level, at its anterior part, with the crest of the ilium. An oval-shaped, projecting lobe, in course of time, formed on its most depending face, near Poupart's ligament; and the feeling communicated to the finger, when examining that part, bore the greatest resemblance to what is conveyed by pus, when near the surface of an abscess. The subsequent progress and termination of the case, showed that the tumour was one of medullary cancer.

Treatment of external spinal abscesses.—In discussing the question of the two kinds of anchylosis of the spine, the true and false, reasons were advanced for believing that, when an abscess at the seat of disease subsided, to give place to ossific union, it was to the arrest of motion caused by the consolidation of the posterior segment of the spine that the beneficial effects were principally to be ascribed. In such cases, the abscess is confined within the range of the rigid portion of the column. But when unfavourable influences interfere with the termination in anchylosis, and the abscess enlarges by extension of its walls downward, it gets beyond the bounds of the inflexible part, takes its place in movable structures, and consequently loses the advantage which rest is calculated to confer. Thus progressive increase goes on, and the abscess eventually presents superficially, where, of course, exposure to the bad effects of motion is worse. These considerations enforce the propriety of employing in the management of such abscesses, every available means for procuring perfect rest.

Another general observation applicable to the subject is, that in common with other collections of pus having their origin in diseased joint structures or diseased bone, it is the continued irritation kept up in the walls of the abscess and adjacent parts, by the presence of the carious bones and ulcerated surfaces, which chiefly leads to the fresh formation of pus; whence all measures designed to forward amendment in the abscess, ought to be accompanied with others directed to improve the condition of the spine at the original seat of disease.

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* See Article CANCER, vol. i. p. 565.

An additional remark may be made, which still applies to large abscesses whether originating in the spine, hip, or other joints, when diseased. It relates to the contrast observed in the condition of the patient, before and after the evacuation of the contents: either when the abscess has burst spontaneously, or been opened by the lancet. It is constantly seen in practice that an abscess of extraordinary size will often remain for many weeks together perfectly quiescent; perhaps enlarging a little at one time, and diminishing a little at another; the patient being all the while free from constitutional disturbance. But if the abscess point and break, or the surgeon open it, and the puncture does not heal, but the matter continues to run, an important change will soon occur. The unfavourable symptoms come on at various periods in different cases. It may be expected that within a few days the quantity of pus from the abscess will greatly increase: that it will become thin, and perhaps variously discoloured. At the same time also, the patient will sicken, his pulse will be quickened, his skin hot, with occasional profuse perspirations; the fever will be hectic, attended with gradual wasting and increasing debility; the liver will probably enlarge by fatty degeneration; and he will die exhausted by the combined effects of the purulent discharge and the fever. (See article HECTIC, vol. i. p. 287.)

Now it is the anticipation of that change being brought on by evacuating a lumbar or psoas abscess, that chiefly leads to hesitation and delay in the treatment. The surgeon may rest, for a while, on the hope that he may possibly succeed in dispersing the collection by resolution: he therefore keeps the patient rigorously at rest; supporting the strength by tonics and diet; and he applies assiduously tincture of iodine to the back, at the seat of disease; to the side, in the course of the abscess; and to the swelling itself; he thinks that if the abscess be not altogether removed by such means, its size will be diminished, and the walls converted into a fitter condition than before for the operation of puncturing. His expectations, however, will probably not be answered favourably. He may perceive that at some particular part there is an appearance of acumination, and he is desirous of averting spontaneous opening. Necessity, therefore, seems to compel him to adopt the plan of tapping the abscess and drawing off the pus. It may be supposed that the proceeding has been carried out in the most approved way, with all the precautions commonly urged (see article ABSCESS, vol. i. p. 115); yet the almost inevitable termination will be, a bursting forth of the matter, from the temporarily closed openings artificially made, and an established discharge from the abscess, with all the uncontrollable ill-effects apprehended as the sequel. These considerations prompt us to greet with welcome the valuable labours of Professor Lister, and of others, in their present active endeavours to improve this part of surgery.

Affection of the Spinal Cord from extension of the Disease.

When we consider the delicacy of structure and constitution of the medulla spinalis, and its contiguity to the centre of so destructive a morbid action as caries, we may be surprised that its functions are not lost in a greater number of cases than experience shows to be the fact. Yet, as the surgeon has no means of foretelling, in any particular patient, whether the cord will be affected or not, he is kept in constant apprehension.

Several circumstances combine to protect the cord from injury. First, in proportion as the spine falls forward, and forms an angle at the seat of disease, the abscess is propelled to the front, and the chasm between the bodies is closed behind, so as to prevent the pus from having access to the vertebral canal. Secondly, it is within the posterior segment of the spine that the cord is contained; and it has been formerly shown that, while the anterior segment, composed of the bodies, is the special seat of caries, the posterior is exempt from disease, and has a reparative or defensive action carried on within it: the cord, it may therefore be inferred, will not be injuriously affected by such kind of action. Thirdly, it might justly be feared that when a part of the spine had been destroyed by caries, and a deep gap formed between two or more of the bodies, the column would be so much weakened that it would be liable to be broken by any slight injury; and that the cord would therefore be crushed and deprived of its functions. But it has been already pointed out (supra, p. 115), that when caries attacks the vertebræ in front, a process of agglutination and consolidation, terminating in firm osseous union, is immediately set up in the posterior surfaces of the same bones. Hence, in proportion as the spine yields to the pressure of the superincumbent weight, and the upper part tends to fall forwards, that movement is restrained and moderated by the opposition of the structures behind, which have thus been endowed with increased strength. Accordingly the angle at the seat of disease is formed in a slow, gradual manner, without jarring or abruptness; and the cord becomes accommodated to its novel position without loss or impairment of its functions.

Before describing the morbid condition of the cord from which paraplegia ensues, it may be interesting to notice certain considerable changes in its structure which are connected with the deformity, but which do not involve any deprivation of its functions. When a large portion of the front of the spine has been removed by caries and the surfaces have united, not only will the characteristic angle be formed, but the column will be considerably diminished in length at the seat of disease. This shortening is to be attributed to the loss of substance which the affected vertebræ will have sustained, and to their having collapsed into a comparatively small size before union. The vertebral canal and the cord contained in it, will necessarily participate in this bending and shortening, and be accommodated to both. Now it may be inferred that, to bring about the adaptation adverted to, a succession of minute interstitial changes in the substance of the cord must have been wrought during the progress of the deformity; that certain portions of the material will have been abstracted and their places not filled up; and that other portions will have been arranged in a different order from at first. It is not found, however, that either the atrophy, or novel arrangement of the nerve substance, has a prejudicial effect on the functions; for these will remain entire, however extreme the deformity. The explanation is founded on a well-known law in the pathology of the brain and cord; namely, that changes of extraordinary magnitude may be effected in their structure by encroachments of various kinds, without the sacrifice of their functions, on condition that the intrusions are made slowly and gradually. Remarkable examples of the kind, connected with atlo-axial disease, will presently come before us (infra, p. 143). Moreover, every case of lateral curvature furnishes examples.

Disorganisation of the cord; paraplegia.—From what has just been stated, it will be perceived that the change of structure in the cord which causes paralysis of the lower extremities, is not the mere alteration of its figure or size consequent on the angular deformity. It consists in a conversion of a portion of its substance into a new morbid tissue. A certain part of the organ, adjacent to the seat of caries, undergoes a process of breaking-down of its texture; the most conspicuous effect of which is a softening, approaching to liquefaction, of its columns and grey matter. If the diseased part be tapped with the finger, it will readily yield to the slightest pressure; if a stream of water be allowed to fall gently upon it, the soft substance will be washed away, leaving the connecting tissue. When the cream-like matter is examined in the microscope, it is observed to be made up of innumerable fragments of nerve-tubes, granules, oil-globules, and amylaceous cells, the débris of medullary tubes and ganglion-cells. A tinge of yellow pervades the softened and neighbouring parts. The membranes do not commonly present any decided signs of having been implicated, nor is the vascularity much altered.

It will depend on the depth to which the morbid change reaches, in any particular case, as to the functions of the cord which will be abolished. We owe to modern discoveries the knowledge of the fact, that to the anterior column, from which the anterior roots of the spinal nerves arise, belongs the power of controlling the muscles; and that to the lateral column, from which the posterior roots arise, belongs sensation. Hence if the disease penetrate only so far as to destroy one column, leaving the other sound, we may anticipate that the function pertaining to the disorganised column will alone be lost.

Experience proves that, in paraplegia caused by disease of the spine, motor power is much more frequently destroyed than sensation: and so general is this fact, that it may be regarded as a comparatively rare thing for both motion and sensation to be lost simultaneously. As to the reverse kind—abolition of sensation with motor power remaining—it is doubtful whether such a variety was ever met with.

When we consider the relative position of the different columns of the cord to the centre of disease in the spine, we shall at once perceive why motion should be first destroyed. The anterior column, on which motor power depends, is separated from the bodies of the vertebræ only by the theca vertebralis and the other membranes of the cord: hence it may be expected that, when the morbid action proceeds backward, this column will be deprived of its function before any other. And its liability to be so involved will be increased by the compression to which it is peculiarly subject from the bending of the spine, as it forms an acute angle at the part.

Moreover, if we trace a filament of an anterior root to its origin, we shall find that, as it is about to join the cord, it subdivides into numerous minute radicles, and that these lose themselves almost imperceptibly on the *surface* of the anterior column. If, on the other hand, we take a filament of a posterior root, we shall observe that it continues as a single fibril up to the cord; that when arrived there, it dips bodily, without subdivision, into the fissure between the posterior and lateral columns; that while in the fissure, it pursues an unbroken course to the bottom; and that its actual termination is in the *deepest* part of the cord, where the central cineritious matter is situated. It appears, therefore, that the part of the medulla appropriated for sensation must be in the internal, well-protected recesses of the organ; where it is less likely to be reached by disease invading the exterior, than the column of motion, situated more superficially.

It will depend on the height in the spine at which the cord is diseased as to the extent of the body that will be paralysed. If the disease be in the lower lumbar vertebræ, that is below the termination of the cord, there may be an absence of paralysis: unless, as occasionally happens, the products of inflammation have extended upward, to involve the medulla above. In not a few cases, one extremity is more completely deprived of motor power than the other. Comparing the paraplegia resulting from disease with that from injury, it is remarkable that the former is seldom accompanied with loss of command over the bladder or rectum; and that when these organs are affected, it is commonly in a slight degree. Retaining sensation, the patient may have an urgent desire to pass water, but he will be unable to do so, and will require the assistance of the catheter. Again, the stools may pass at one time involuntarily, at others consciously. In general, the torpidity of the bowels renders it necessary to give aperients frequently.

The cases are comparatively rare in which the loss of power in the limbs leads to the formation of bed-sores. If the patient be an adult, who suffers much pain at the seat of disease, making it difficult to shift his position, there will be danger of such sores; but not so great as in cases of paraplegia from fracture of the spine, when the fæces and urine pass involuntarily, and the hips are constantly sodden in the filthy moisture. In a young person, on the other hand, whose body is light, in whom sensation has not been lost, and who can feel the irksomeness of lying for a long time in the same posture, we do not look for sores; he can turn himself by the use of his arms, change the position of his hips, and thus avoid the bad effects of pressure.

Spasmodic actions of the paralysed limbs.—When the lower extremities are entirely bereft of voluntary power, they are subject, nevertheless, to convulsive actions; through some obscure morbid influence acting on the distal portion of the spinal cord cut off from connection with the brain. The spasms are the same that are witnessed when the cord has been destroyed by violence, or by the encroachment of tumours, ramollissement, &c. A frequent form of the attack consists in a sudden jactitation of one or both legs. While the patient is lying quiet, the limbs will suddenly be drawn up; they will be bent both at the knees and hips—so that the heels will come in contact with the back of the thighs, and the knees with the abdomen: the flexor muscles will then relax, and the limbs will fall straight, as before. In such cases the spasms are of short duration; but they may be repeated with great frequency, so as to cause much distress. A different form consists in the legs being drawn up, and then remaining bent. In these cases, the limbs and body will be so rigidly fixed, that the patient may be moved about in bed, in one mass, like a log of wood. Cases will be met with in which both the above forms are presented, at different times, in the same patient. The spasmodic actions, whether clonic or tonic, are apt to be excited by certain irritants; thus tickling the soles of the feet, pinching or pricking the skin, the act of moving, will bring on the sudden startings, or will aggravate the contractions of the rigidly bent limbs. Micturition and defæcation sometimes, but rarely, excite attacks. Yet they frequently come on without any perceptible cause of irritation. When the patient is drowsy and about to drop asleep, he is peculiarly subject to be woke up by the limbs jumping.*

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* 'Contributions to the Pathology of the Spinal Cord,' by William Budd, M.D. *Med.-Chir. Trans.* vol. xxii. p. 153.

The pain occasioned by the spasmodic affections is sometimes excessive. In certain cases it equals, if it does not surpass, the agony of tetanus in its worst form: happily, in the majority the suffering is moderate and endurable. Sometimes when the convulsions are strong, they shake the whole body, and communicate a painful jar to the diseased vertebræ. Again, if the patient have bed-sores, the concussion produces friction of the hips against the bedding, and that aggravates the ulceration or sloughing. When it is attempted to subdue the spasms by applying splints to the limbs, or by bandaging the leg that is affected to the one that is quiet, and fastening them, when thus secured, by india-rubber tubing to the bedposts, the plan commonly fails; the skin is liable to be frayed, and the pain is not diminished. There is no particular medicine that can be relied on for overcoming the convulsions. Good effect sometimes follows injecting morphia under the skin.

Diagnosis.—As intimated before, paraplegia consequent on caries of the vertebræ does not differ materially from that which may be caused by morbid affections of the cord, of various distinct kinds. The principal diagnostic symptom in spinal disease is, doubtlessly, the angular deformity. Observation shows that paraplegia of this kind does not occur till late in the disease, after the bodies have been partially destroyed. Consequently, if there be no distinct projection of the spinous processes, or rigidity of the vertebræ, to indicate excavation of the column, it is probable that the paraplegia depends on some other morbid affection. Again, palsy arising from caries is commonly distinguished by motor power being abolished while sensation is unimpaired. If the reverse be found, namely, loss of sensation with retention of motor power, it may be inferred that the cord is encroached upon by some morbid growth advancing from behind forward.

Prognosis in paraplegia.—Experience proves that in paraplegia from spinal disease, restoration of the lost powers of the limbs is not uncommon. The mode in which recovery takes place appears connected with the bending of the spine at the seat of the caries. It has been previously stated that, in the majority of cases, the paralysis consists in the loss of function by the anterior column alone, motor power being the only property destroyed: whence it was inferred that but a comparatively small part of the cord was disorganised. It may, therefore, be conceived that, in proportion as the spine sinks under the pressure of the superincumbent weight and the angle at the seat of disease becomes more acute, the sound portions of the cord above and below the morbidly affected part of the anterior column, will approach more closely to one another: and that, in certain cases, their respective surfaces may coalesce and unite. In that manner the continuity of the column will be re-established, and its function restored. If this view be correct, it will follow that, should anchylosis of the vertebræ have taken place before the diseased surfaces of the bodies have come in contact, and when a permanent gap has been formed between them, there will be little chance of recovery. The prognosis is more favourable in children than in adults; which may be ascribed in considerable degree, at least, to the coalescence of the sound portions of the cord adverted to being more readily effected in the former than in the latter, owing to the greater flexibility of the spine in early life. The writer had lately under his care a boy, six years old, with angular deformity in the dorsal region. Within a period of two years, his lower limbs were twice completely paralysed: the first time, for six months; the second, after an interval of eight months, for four. He recovered from the paraplegia, but afterwards died from the effects of extensive abscesses.

The restoration of the power of the limbs, in some cases, is only partial. Certain groups of muscles continue paralysed. This inequality in the condition of the muscles leads to particular forms of contractions and deformities, chiefly in the ankles and toes.

Treatment of Spinal Disease.

The general treatment in spinal disease is founded on the same principles that guide us in hip-disease, scrofulous synovitis of the knee-joint, disease of the ankle, &c. The remedies are directed principally to sustain and strengthen a constitution originally weak and liable to be further debilitated by the effects of the disease. Hence, although it may be occasionally necessary to employ depleting measures for subduing temporary accessions of fever, or quelling short attacks of inflammation, they are adopted with reluctance, and the tonic system is otherwise pursued uninterruptedly.

Of local remedies, 'rest' is deservedly placed at the head of the list. The object sought to be gained is twofold. First, by fixing the diseased vertebræ, we endeavour to prevent jarring and attrition between the rugged opposing surfaces of the carious bodies, and, by removing that source of irritation, to encourage the morbid action to cease. Secondly, by keeping the bones at perfect rest, we afford the parts the most favourable opportunity for becoming consolidated by ossific union.

The most effectual method of arresting motion between the diseased vertebræ, in aid of nature's efforts, is to place the patient in the recumbent position on his back; and to give him the greatest advantages whilst confined, it is desirable that he should be furnished with an invalid-bed, provided with conveniences for enabling him to lie upon it, day and night, without rising. If an ordinary couch be used, the patient will lie with greater security and comfort if the frame for the horsehair mattress, instead of being horizontal, be gently inclined downward from the top to where the hips come, and then be elevated (but to a slighter degree), with a double incline, for the knees to be bent over the angle. A hollow or socket for the reception of the angular projection of the spine ought to be made in the mattress. Or a substitute may be contrived by filling an india-rubber pillow with sand, or suitable grain or seeds, and placing it under the patient's back, protected with blanket and sheet. In young persons, further security will be required, by enclosing the body in a stiff corset; and, perhaps, by strapping them down to the couch. It will add to the convenience if the bed-frame be portable, and capable of being easily transferred to the body of an invalid-carriage, or to a bench in the garden, with a view to the patient's getting fresh air.

It is an important duty of the surgeon to be peremptory in enforcing strict confinement in the recumbent position. He will find this task, of course, more difficult in children than in adults; and the principal cause is the freedom of the patient, in the majority of cases, from pain. Nevertheless, however moderate the symptoms with which the disease is ushered in may be at first, the incipient stage is a period during which a rigid observance of perfect rest ought to be insisted upon. And the time over which that care should extend ought not, even in the most favourable cases, including children, to be less than six or ten months. In patients approaching adolescence, the confinement must be longer.

If the case should proceed favourably, without pain in the back or abscesses coming forward, for the number of months specified above, the next practical question will be, concerning the propriety of liberating the patient from his long durance. That is equivalent to asking, how it may be ascertained that anchylosis has taken place; for it cannot be considered safe to allow the patient to get into the upright position till the bones have become strongly knit. Accordingly, in examining the angular projection, what has chiefly to be made out is, whether there be any motion between the affected bones; for if the part be perfectly stiff, it may be presumed that they are united. Atrophy of the muscles may assist in confirming the point. But it will not be prudent to rely on the solidity of the anchylosis altogether. The patient ought to be supplied with artificial supports. Space does not allow of a detailed description of the best kind of these instruments to be used in different cases; for, of course, they must vary, not only according to the situation of the disease, but the age of the patient. One general remark may be made, that the corsets are to be constructed much in the fashion of women's stays, so as to embrace the body above and below equally and generally; they ought also to be strengthened as much in front as practicable, to counteract the tendency to stoop forward. For giving them the proper stiffness, steel ribs are preferable to whalebone. In young, feeble children, whose bodies are extremely flexible, while their hips are too narrow for being used as a base of support, it may be found best to encase them in separate pieces of prepared leather, moulded to the body, and afterwards inserted in corsets; the lateral pieces or splints may be prolonged downward, to rest on the seat of the chair, and brought high enough to reach the arm-pits, so as to act as crutches while sitting.

Prone-couch.—A mode of reclining in the prone position, instead of on the back, has been much recommended. The method consists in making the patient lie upon his chest and abdomen, on an elevated frame, not unlike a desk, with an inclined board upon which his legs may hang: he is prevented from sliding by pegs at the top received into the arm-pits. The object of the position is, by fixing the upper part of the trunk, and allowing the hips and legs to glide down the incline, to keep the spine on the stretch, and so diminish the acuteness of the angle at the seat of disease. But such a design is opposed to the principles advocated above (see p. 117). It is evident that if the angular projection be diminished, the surfaces of the diseased bodies of the vertebræ, which ought to meet, will be kept apart, and anchylosis will be prevented. Moreover, as the patient cannot sleep, and cannot empty the bladder or rectum while confined on the apparatus, it will be necessary to move him frequently, to the great injury of the back. But it will, perhaps, be said, that although the employment of the prone-couch be not adapted to caries in its active stage, it may be advantageously used to improve the figure, when anchylosis has been effected. That desire on the part of patients, who have narrowly escaped death at the price of being deformed, to have their cure made absolutely perfect by getting rid of the hump on the back, may be natural; but it is scarcely necessary to say how utterly vain such hopes are.

Counter-irritants.—It is not long since that, in cases of angular deformity, issues were almost invariably ordered, on each side of the protuberant vertebræ, whether the patients were young and weak, or the disease acute or chronic, or there were abscesses or paraplegia. They had a debilitating effect, and were attended with much constitutional irritation. According to the practice of the present day, issues are reserved for subduing casual accessions of the morbid action, when the pain is great, or when there is a threatening of paraplegia. They effect all their good in a short time, so that it is not necessary to keep them open. Blisters give rise to so much general inconvenience that they are seldom had recourse to. Compound tincture of iodine, as a local application, has supplied us with an efficient substitute for these coarser remedies.

DISEASE OF ATLAS AND AXIS.

Disease affecting the two highest vertebræ of the spine has certain peculiarities which entitle it to separate consideration. The same cause which makes accidents to those bones more dangerous than elsewhere,* renders morbid action more perilous. The portion of spinal cord contained within the ring of the atlas is the most vital in the nervous system. Hence, whatever tends to weaken the joints in that part, exposes the patient to the hazard of sudden death, or of paraplegia including the whole body below the head.

Both atlas and axis, especially the former, differ from the other vertebræ in their anatomical structure. The atlas is deficient in the part that corresponds to a body; and there is no fibro-cartilage either between the axis, or the occipital bone and it: hence, as these structures are the proper seat of caries, it may be expected that the morbid process which attacks the two bones will differ from the ordinary disease of the spine.

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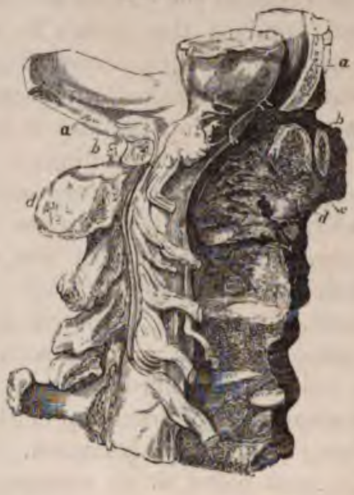
* See INJURIES OF THE BACK, vol. ii. p. 394.

The joints particularly subject to be affected are those between the atlas and axis. And a reason may be assigned for their being peculiarly prone to disease. The term 'axis' implies that the vertebra so called is the centre of the rotatory movements of the head; and as the spokes in a carriage-wheel inserted into the axle act upon that central point with great lever power, so that when a break-down occurs it is the axle that gives way, a corresponding impulse is directed upon the pivot of the axis, by sudden violent rollings or twistings of the head. These shocks and sprains, often repeated, predispose the articulations, in a delicate patient, to disease.

The morbid action thus set up in the atlo-axial joints is similar in pathological character to what commonly occurs in the wrist, elbow, knee, &c. Proceeding generally in a chronic form, it gives rise to a gradual softening and spongy thickening of the synovial and fibrous tissues that connect the vertebræ; and subsequently to ulceration of the cartilages, and superficial corrosion of the bony structures. The disorganisation will go on in most cases to an extreme degree without signs of abscess.

That which contributes principally, as intimated before, to the importance of disease in this locality, is the danger threatened to the spinal cord at its most vital part. Owing to the head being sustained on the atlas, and the ligaments which bind the latter and axis ceasing to be able to retain them in position, the weight of the head causes the atlas to glide forward and downward upon the axis. This movement implies that not only are the articular surfaces separated from each other, but that the odontoid process of the axis is detached in an equal degree from the surface of the atlas which rolls upon it. Now, it is from this last-mentioned change that the risk to the spinal cord chiefly arises. The anterior arch of the atlas cannot be separated from the odontoid process, except by the stretching and elongation of the transverse ligament which embraces the neck of the process, and of the accessory restraining ligaments. Accordingly, if the weight directed on the atlas should be suddenly increased while this extension is in progress, and the ligaments are correspondingly weakened, the danger is imminent of the latter being ruptured. And should that event occur, there would be nothing to prevent the atlas, with the head as its freight, from sliding abruptly forward on the surface of the axis to its utmost reach. The consequence would be, that the portion of spinal cord contained within the ring of the atlas would be compressed by the posterior arch of that bone against the odontoid process in front, and be thoroughly crushed, and the patient's death would be instantaneous.

Fig. 222.*



But, happily, these cases are not always so formidable. In not a few, the transverse and restraining ligaments undergo extensive stretching of their fibres without being ruptured.

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* Atlo-axial disease. Figure from specimen in Middlesex Hospital Museum. *a*, *a*. Portion of occipital bone, in proper relation to atlas. *b*, *b*. Section of atlas. From destruction of the ligaments of the atlo-axial articulations, the atlas has slid forward, borne by the weight of the head, and has carried the odontoid process of the axis with it. *c*. Odontoid process of axis: loosened at its base by disease, it has been carried forward in connection with the atlas. *d*, *d*. Section of axis: its odontoid process detached: its articulations with the atlas, and with the body of third vertebra, and its body, all much diseased: the great projection backward of the spinous process in reference to the occiput and atlas, is a result of the gliding forward of the latter. Within its canal the spinal cord is seen bent at an obtuse angle: the consequence of the portion contained in the foramen magnum and atlas being carried forward, while that in the axis has been stationary.

Case: The patient, a butler, past the middle age, and corpulent, had for some

They continue, therefore, to retain a hold of the atlas; and to keep a check upon it, as it glides forward upon the axis. Besides, the connecting structures in general surrounding the diseased vertebræ are agglutinated by deposition and induration of coagulable lymph, and the shifting movement proceeds slowly. Thus displacement may take place to an extraordinary degree. In many cases the atlas will be transported to the front to such a distance, that less than one-half will remain resting on the axis, the anterior part protruding unsupported beyond its level. The posterior arch of the atlas will then cease to be in relation or coaptation to that of the axis; it may be transported so far forward, that it will even bisect the vertebral canal into equal parts. Hence about a moiety of the area of the canal appropriated for holding the spinal cord and its membranes may be absolutely cut off. It might have been conjectured that a loss of substance, and alteration of figure so great as this description implies, would have been altogether incompatible with the cord retaining its functions. But experience shows that if the morbid action be chronic, and the dislocation take place slowly and gradually, the disease may run its course without paraplegia ensuing, and the patient will recover with deformity of the neck alone. Again, it is found that in those formidable cases in which paraplegia both of the upper and lower extremities has occurred, the patients may regain the power over their limbs, and be restored to perfect health; the spine, of course, remaining distorted. The phenomena are to be accounted for according to the pathological principle already adverted to (p. 134). The diminution in the substance

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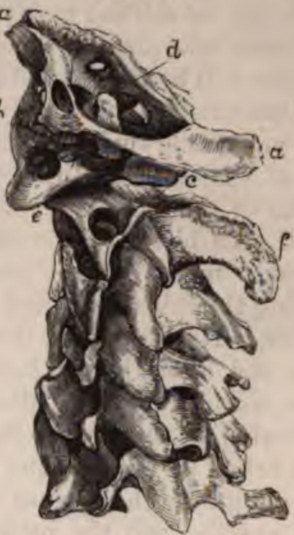
time stiffness in the neck, with pains in the head and arms, supposed to be rheumatic. When seen by the writer, a large swelling extended from the upper third of the neck behind, to the highest part of the occiput, concealing the forms of all the bones which it covered, except the spinous process of the axis, which appeared unduly prominent. He could perform the nodding, but not the rotating motion, of the neck. The vertical axis of the head was advanced perceptibly too far forward, in comparison with the vertical axis of the neck; the effect apparently of the head having been transported to the front slightly beyond its proper plane in relation to the spine. The disease was seen to be atlo-axial; and he was removed to the hospital. Progressive paraplegia soon commenced, and it proceeded downward; first, one arm became weak and then paralysed; shortly afterwards, the other also became weak and then paralysed; and the lower extremities followed the same successive course. But before the legs were totally paralysed, he died; his death having been accelerated by a severe attack of bronchitis.

and the disfigurement of the cord generally have been consequent on a slow process of interstitial change; and it has been seen that deviations from the normal size and shape, of the most surprisingly great kind, can be made in the spinal cord, as well as the brain, without sacrifice of their endowments, if wrought in that gradual manner.*

Fig. 223.



The specimen from which the figure was taken was removed from the body of a man found dead in the streets. There was fracture at the base of the skull, all round and at a short distance from the foramen magnum; the boundaries of the fracture being seen in the figure. *a*, *a*. Portion of occipital bone, insulated by the fracture. *b*. Anterior tubercle, on anterior arch of atlas. *c*. Posterior tubercle, on posterior arch of axis. *d*. Odontoid process of axis. Its situation corresponds nearly to the centre of the vertebral canal, at the level of the foramen magnum and atlas. *e*. Body of spinous process of axis. About three-fifths of the articulating surfaces of the atlas have been displaced forward on the corresponding surfaces of this bone, thereby accounting for the projection anteriorly of the front segment of the atlas. *f*. Spinous process of axis. The posterior segment of the ring of the atlas crosses the canal of the axis nearly in its middle. The distance between the posterior surface of the odontoid process, and anterior surface of the posterior arch of the atlas (the antero-posterior diameter of the vertebral canal), measures from a third to a quarter of an inch; that between the odontoid process and the anterior arch of the atlas, at the original sites of their articular facets, is five-eighths of an inch. The space between these points is traversed by an irregularly cylindrical beam of bone which unites the two surfaces: this new growth of bone is not visible in the drawing, but it had obviously been formed during the process of displacement of the atlas upon the axis, and attests the slow rate at which it had taken place. For a more detailed description of the specimen, accompanied with a drawing representing it in a different view, see *Med.-Chir. Trans.* vol. xxxi. p. 289.

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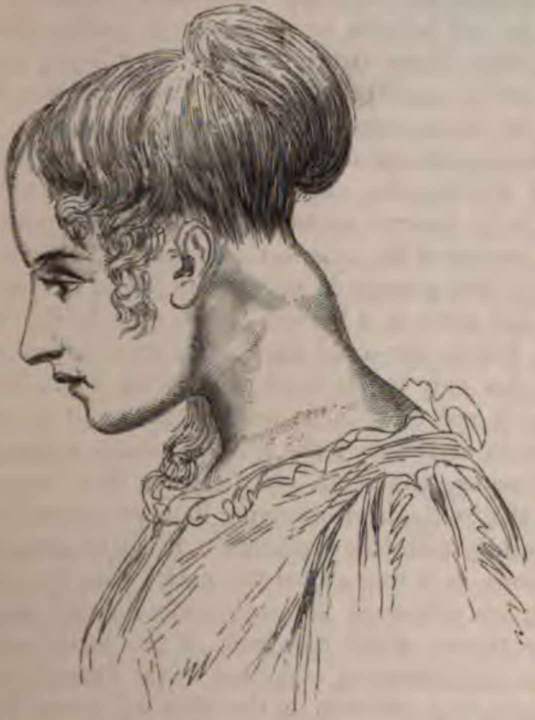
* In a specimen of consecutive dislocation of the atlas upon the axis described by Mr. Paget, the displacement exceeded what has been stated in the text. Fully two-thirds of the atlas must have been entirely thrown off the

As in spinal disease generally, persons of scrofulous habit are most prone to be affected in the atlo-axial articulations. The last case observed by the writer was in a young woman, who, just after recovering from disease in these joints, had angular deformity from caries in the dorsal vertebræ. The most common age at which it commences is near puberty; but neither infants nor adults are exempt.

FIG. 224.*



Symptoms.—A general swelling around the nape of the neck,

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upper articulating surface of the axis. On measuring the part of the vertebral canal available for holding the spinal cord, it was found that the distance was only two lines from the odontoid process, and three lines, at the most, from the body of the axis to the posterior arch of the atlas (the normal measurements being from nine to eleven lines). In the neck of the odontoid process there was a deep indentation; which proved that the transverse ligament had retained its hold of the atlas to the last without being ruptured; and that the displacement had taken place slowly.—*Med.-Chir. Trans.* vol. xxxi. p. 285.

* The girl, aged fifteen, from whom the drawing was taken, had continued in her situation as a domestic servant, till three weeks before her admission into the hospital; at which time the neck was distorted as represented in the

attended with stiffness, and pain in motion, are the earliest indications of the disease. The patient will prefer the recumbent position to being erect; keeping his head sunk in a soft pillow. When upright he will steady his head by placing a hand on each side; and if asked to rotate it, he will stiffen his neck, and turn the whole body round. The nodding motions he will be able to perform. A sudden jolt, or a tap with the hand on the crown of the head, will give pain. As the swelling of the upper part of the neck may probably be mistaken at first for enlargement of the lymphatic glands, or deeply-seated abscess arising from some other cause, the most certain mode of deciding the question as to the real nature of the disease, is to observe accurately the relative position of the spinous process of the axis to the occiput. Notwithstanding its large size, that process is not readily felt in the normal condition; it lies sunk in a hollow, arched over by the ligamentum nuchæ. But in atlo-axial disease the spinous process becomes distinct, not only to the touch, but to the eye. That change, however, is not consequent on the axis itself protruding; for this bone is stationary; the spinous process appears to project merely because the atlas, carrying the skull upon it, glides away to the front, thereby leaving it more exposed and defined. In conformity with this explanation, it will be perceived that the head droops, as it were, upon the neck; that the chin and face generally are advanced preternaturally forward in comparison with the throat, while the back of the head is deficient in rotundity and fulness in reference to the line of the spine. It may happen that one side of the atlas will move forward more

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figure. The disease had apparently commenced four months previously; but it had caused so little pain or inconvenience, that she had not been obliged to give up her work during its progress. She complained of pain darting from the swelling in the neck upward to the crown of the head, and downward over the shoulders, and along the arms. She had also slight incontinence of urine. The most prominent part of the swelling in the neck was formed by the spinous process of the axis; above which, and between it and the occiput, a distinct hollow could be felt. Chiefly by rest and counter-irritants, she improved so much that in six weeks she was discharged. But three weeks afterwards, she was readmitted on account of an aggravation of the former symptoms, and there being a weakness of the lower extremities, which caused them to sink under her when she attempted to walk. In a month she was sufficiently recovered to be sent to a convalescent hospital at the seaside. She subsequently called various times at the hospital, to show that she had regained her strength completely. A cast from the neck is in the Museum of the Middlesex Hospital.

than the other, when there will be added a little obliquity to the position of the head.

Prognosis.—Patients may pass through all stages of this complaint, till it ends in deformity and anchylosis, without any positive indication of the spinal cord having been affected. Yet the surgeon cannot fail to be in constant apprehension, and to watch every symptom narrowly. Pains darting upward to the back of the head, and simultaneously downward over the shoulders and clavicles, perhaps give the first alarm. The latter sensations are sometimes prolonged to the finger-ends, accompanied with slight muscular weakness. Such symptoms alone might be explained by supposing that the roots and trunks of the nerves given off from the cord in the neighbourhood of the disease, had become affected by the process of displacement and morbid action external to the spine, without the medulla itself being involved. But prudence will not allow that view to be too much relied upon. Should there be added any symptom of the lower extremities becoming paralysed—as a tendency to trip in walking, or a sense of pricking or of numbness in the feet—the conclusion will at once be drawn that the morbid action has penetrated to the medulla. In certain cases the paralysis of the upper and lower extremities will be but imperfectly pronounced; and it will pass off. In a single case seen by the writer, the muscles became affected with tonic spasm; the whole body was so rigid that on turning the patient in bed she rolled with the stiffness of a corpse having rigor mortis; that condition lasted for a month; it gave place gradually to ordinary paralysis, from which she eventually recovered. When the paraplegia is complete, the patient is in a singularly helpless state, being deprived of voluntary power and sensation both in the upper and lower extremities at once. Yet, notwithstanding the apparently hopeless condition of patients in these cases, experience proves that they frequently recover. The prognosis will be, of course, more favourable in young persons than in those above the middle period of life. With his colleague Dr. M. Crawford, the writer attended a man, whose age was forty-eight, for disease in the atlo-axial articulations; during six months his whole body, from the head to the toes, was paralysed; yet he eventually recovered, with his neck merely stiff and distorted.[*]

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[*] See a paper by Sir William Lawrence, 'On Dislocations of the Uppermost Vertebræ of the Neck,' in *Med.-Chir. Trans.* vol. viii. Also 'Lectures on

Treatment.—In disease of the atlo-axial articulations, the utmost danger would be incurred if the patient fell forward on his head; in its stretched and attenuated condition the transverse ligament would readily give way, the atlas would thus be free to slide forward and compress the spinal cord by its posterior arch. Special care is therefore required to preserve the head and neck of the patient in a state of perfect rest. Accordingly, constant uninterrupted confinement in the recumbent position is necessary. And the patient's head ought to be laid on cushions, which will prop it equally on every side. For that object, the india-rubber pillow, stuffed to a proper degree of firmness with grain, so that it may easily be pressed into a hollow which shall fit the back of the head and nape of the neck, is to be used. Or the sand-bags recommended by Mr. Hilton will be more easily procured. A band ought also to be passed over the forehead, from the sides of the pillow, to restrain motion. In the event of the patient being restless and liable to lift the head inadvertently, as during meals or sleep, it is a useful precaution to have a shield moulded, either in gutta-percha, or prepared leather, to the back of the neck; this ought to take in the shoulders below, and reach to the vertex above, so that it may be secured by bands both to the shoulders and head, to arrest movement.

Necrosis of atlas.—Before quitting the subject of diseases of the upper vertebræ, a rare affection of the atlas may be briefly noticed. This consists in necrosis and exfoliation of that part of the anterior arch of the bone which corresponds, in other vertebræ, to the body. The disease is connected with ulceration of the back of the pharynx; and it has been commonly observed in syphilitic patients. In some recorded cases, the whole thickness of the bone has come away, as shown by the articular surface of the odontoid process of the axis being visible. From the patient's surviving, it cannot be doubted that the insertions of the transverse ligament had been preserved entire; and that it had retained its hold of the process.

Pain and the Therapeutic Influence of Rest,' by Mr. Hilton, Lecture V. A very remarkable case of disease of the superior cervical vertebræ, with intrusion of the atlas and axis, through the occipital bone, into the cranium, has been communicated by Dr. Lochee and Mr. C. H. Moore to the *Lancet*. See number for November 23, 1867. The preparation is in the Museum of the Middlesex Hospital.

A sloughing ulcer in the posterior fauces, with occasional attacks of difficult deglutition and breathing, have been the most prominent symptoms. When the fragment has been picked away, the sore has healed, and the patient recovered. It need scarcely be said, that a patient who has such a threatening disease, in a situation of so much danger to life, is in a critical condition while the dead portion of bone remains as a source of irritation, and that the greatest caution is demanded to protect him from sudden bending forward of the head.*

ALEXANDER SHAW.

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* See case narrated by Mr. Keate in *Medical Gazette*, vol. xvi., 1835. 'A Case of Exfoliation of the Anterior Arch of the Atlas,' by Mr. R. Wade, *Med.-Chir. Trans.* vol. xxxii. p. 65. Lectures by Mr. Hilton, op. cit. p. 99.

DISEASES AND INJURIES OF NERVES.

PART I.

NERVE-LESIONS AND THEIR MORE IMMEDIATE EFFECTS.

Diseases of Nerves.

NERVES are subject to as many disorders and injuries as most of the other tissues of the body. They are liable to inflammation, suppuration, ulceration, and gangrene; to atrophy and enlargement; to softening and induration; to the formation of cysts, fibrous or neuromatous tumours, and cancerous growths along their course; to compression or stretching; to contusions, lacerations, punctures, and partial or complete division.

Inflammation of Nerves.

Inflammation of nerves is less common than that of most other soft tissues. It attacks in preference the sanguine and robust, and adults rather than children, in whom neuritis is rare. It may be either acute or chronic, and either idiopathic or traumatic.

Acute neuritis is generally preceded by the usual prodromata of inflammation. Its characteristic symptoms consist of a tearing, darting, or lancinating pain along the course of a nerve-trunk or its branches, attended with a sensation of tingling, formication, or numbness, which are sometimes followed by partial or complete paralysis of the muscles supplied by that portion of the nerve which is below the seat of inflammation. The pain never becomes *suddenly* severe or ceases suddenly, or intermits, as in non-inflammatory neuralgia; for although it frequently remits or abates, it is a continuous pain which gradually increases in intensity and gradually subsides. It is always aggravated by pressure on the inflamed portion of the nerve, by contraction of the muscles to which it distributes branches, or even by the slightest touch along its peripheral course; while, on the other hand, it is relieved by firm pressure above the seat of inflammation. Sometimes the nerve is swollen at the part affected, resembling a cord stretched along the surface of the limb. Usually the movements of the limb are much impaired, and there is often a convulsive agitation of its muscles. The pulse is frequently strong and quick, the temperature of the skin over the inflamed part is much increased, and there is generally a variable degree of sympathetic fever, in proportion to the size of the affected nerve and the intensity of the inflammation.

The seat of inflammation in neuritis is the neurilemma and the connective tissue between the bundles of fibres; and whatever changes the fibres may undergo are the consequences of deranged nutrition. When the inflammation has been of moderate intensity and not of long duration, the nerve has been found to be more or less altered in colour, varying from a pale rose to a deep red, according to the greater or less amount of vascularity in the neurilemma and interfibrillar connective tissue. For the same reason, also, there is a variable increase in the diameter of the nerve, its component bundles being separated from each other more widely than usual; but the fibres retain their natural structure, or at least do not appear to have suffered any remarkable change.

The inflammation may either terminate in resolution or reach its greatest intensity. In the latter case, the nerve is extremely vascular and of the deepest or violet red throughout its entire thickness. Its volume is still further augmented, sometimes to twice or even three times its natural diameter. This is the result partly of the increased hyperæmia, and partly of the inflammatory products that are poured out. These products consist of sero-fibrinous or sero-sanguinolent fluids; of pure blood, or blood mixed with pus, infiltrated into the neurilemma and between the bundles of the nerve-fibres, which undergo disintegration or degeneration, in consequence of impaired nutrition. Sometimes the nerve is softened and easily torn, or even reduced to a pulp; at other times it is indurated and tense from coagulation and hardening of fibrinous exudation. In some cases it is interspersed with minute ecchymoses, or with hard grains along its inflamed course; in other cases it is covered with small abscesses, or enveloped in pus or purosanguinolent fluids, or fibrinous exudation; or it contracts adhesions to contiguous parts.

Chronic neuritis may either result from incomplete resolution of acute inflammation, or be the continuation of a milder form. In either case it is a frequent cause of certain kinds of neuralgia, of neuroma, and painful subcutaneous tubercle. Its morbid anatomy consists of an increased vascularity of the affected nerve; sometimes of a varicose state of its blood-vessels; of a thickening and induration of the neurilemma, in consequence of coagulable exudations. In a variable degree the nerve assumes a somewhat slate colour, loses its characteristic opacity, and when examined under the microscope, the nerve-fibres are found to have fallen, to a greater or lesser extent, into a state of disintegration.

Idiopathic neuritis, although much less common than traumatic, is, I believe, more frequent than it is generally considered to be. Its chief exciting causes are exposure to cold, to damp, and particularly to the combination of both; the suppression of profuse perspiration; the arrest of hæmorrhoidal discharges; excessive bodily fatigue; strumous or tubercular affections, and sometimes visceral inflammations and suppurations.

Martinet relates the interesting case of a deserter—an athletic young man, who after an obstinate chase through a wood, was captured by the gendarmes covered with sweat, and in a state of wild excitement. On the third day after his capture, he was unable to sustain himself on his legs, and experienced an excruciating pain along the back of his thighs, in the course of the sciatic nerves. Soon after, the patient was attacked with pneumonia, and died on the eighth day of his illness. On post-mortem examination, both sciatic nerves were found to be as thick as the index finger, and hard and resisting. All their component bundles were separated from each other by a sero-sanguinolent fluid, and were penetrated by a multitude of blood-vessels, which imparted to the nerve a deep-red colour.* Gendrin mentions the somewhat similar case of a man who walked from Lyons to Paris. During the last two days of his journey, he experienced a dull pain in the course of the right sciatic nerve. The right leg became entirely useless, and the patient died in a fortnight. On examination, the right sciatic nerve was found to be of a deep rose colour at one part, and of a deep red at another. It was infiltrated with serous fluid, and three times its natural diameter.† Martinet has recorded nine other cases of idiopathic inflammation of nerves, the most important of which I will very briefly describe.

Case 1: Violent and continuous pain in the course of the left cubital nerve, without impediment to the muscular movements. The nerve attained the size of the little finger, and appeared like a cord stretched along the arm.

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* L. Martinet, 'Mémoire sur l'Inflammation des Nerfs,' *Revue médicale*, 1824, tome 2^{me}, obs. v.

† Gendrin, *Histoire anatomique des Inflammations*, tome ii. pp. 143–4.

Case 4: A woman previously in good health began to have pains along the left arm. These pains gradually became violent and extended to the fingers. First weakness, and then paralysis of arm with numbness. A blister to the inner side of the arm brought back the power of movement, which, however, was again lost, with increase of pain, as soon as the blister healed. Eight or ten days later, pain was felt in the opposite arm, but the power of movement remained. After some months, during which her condition varied, she had acute pain in the right *lower* extremity, followed by loss of motion. A slough formed on the sacrum, and death ensued a few days later. On post-mortem examination, the spinal cord was found healthy, but the median nerve on the left side, at its separation from the other branches of the brachial plexus, was of a deep red colour *throughout its entire thickness,* for about two inches in length. A nearly similar condition was found in the anterior branch of the seventh cervical nerve which contributes to form the median. The right *sciatic* nerve, enveloped in a large quantity of gangrenous areolar tissue, presented, at its superior part, and for a length of about two inches and a half, a deep brown colour through its whole thickness, but without any alteration of either its volume or consistence.*

From this interesting case, we learn that nerves situated at a distance from each other, may consecutively and independently become affected by idiopathic inflammation.

Mr. Earle,† Sir Charles Bell,‡ Barensprung,§ and others, have recorded interesting cases of idiopathic inflammation of nerves. Barensprung's case was a scrofulous child, one year old, in which both roots of the sixth, seventh, and eighth intercostal nerves were found enlarged and red. Martinet's eighth case was also a child, twelve years old, who had for some time shown the characteristic symptoms of phthisis, and in whom there was violent inflammation of the left sciatic nerve. The child died in about seven weeks in a complete state of marasmus. On examination, numerous tubercles were found in both lungs, the greater number in a state of suppuration. The left sciatic nerve was not sensibly increased in volume, but the whole of its upper third was embedded in sanious pus, which separated it from the surrounding muscles. The same kind of pus was found between its bundles. This case and the preceding one are particularly interesting from the fact of their occurring in children, in whom neuritis is rare.

Traumatic neuritis is much more common than idiopathic. As the term implies, it is the result of some external injury, such as wounds, contusions, fractures, dislocations, surgical operations, &c. According to my own observations, it is less frequently fatal than the idiopathic form.

Treatment of neuritis.—The most important remedies to be employed in the treatment of *acute* neuritis, are the local abstraction of blood by means of cupping or leeches; evaporating lotions or anodyne fomentations; a spare diet with the use of purgatives; tartarated antimony, opiates, belladonna, and the preparations of aconite. When there is reason to believe that the inflammation is of a gouty, rheumatic, or syphilitic character, colchicum, iodide of potassium, or perhaps mercury, should be employed. In cases where it is complicated with serious internal disease, or associated with a low cachectic condition, the treatment must be modified accordingly.

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* Martinet, loc. cit.

† *Med.-Chir. Trans.* vol. vii

‡ Dr. Cooke, *On Palsy*, p. 98.

§ *Annalen des Charitekrankenhauses.*

In *chronic* neuritis repeated blisters along the course of the nerve sometimes afford great relief. Anodyne fomentations, and especially liniments of aconite, belladonna, chloroform, and opium are frequently of signal service. At the same time attention must be directed to the state of the general health. Vegetable and mineral tonics, iodide of potassium, and mild aperients are sometimes indispensable.

Ulceration of nerves, as a primary affection, appears to be unknown; but nerves in the neighbourhood of ulcers are liable to become involved in the morbid process, and then they are generally the cause of intense and protracted suffering.* In such cases, the surrounding soft parts are often enlarged, the skin increases in thickness, the muscles and tendons share in the ulceration, and even the bones increase in dimensions. On either side of their ulcerated portion the nerves are generally thickened, sometimes to nearly double their natural diameter.

When these ulcers are exceedingly painful, Mr. Swan recommends the use of ointment made with powdered opium, or lotions made by mixing well-powdered opium with water, or lime-water. These should be applied on lint, and then a folded cloth moistened with water, or laudanum and water, should be placed over the surrounding skin; at the same time the digestive organs should be regulated. When other remedies have failed, and the disease is confined to the soft parts, excision of a portion of the nerve will be advisable, but if the bone be affected by caries or necrosis, amputation may be necessary. Mr. Swan recommends, that in excising a portion of the nerve, the operation should be performed as far as possible from the ulcer, because there is then a much greater probability that the external wound will heal by the first intention, and that consequently the cut ends of the nerve will escape inflammation and ulceration. It is also advisable to divide the nerve as near the upper part of the wound as possible, as the end of the nerve will thus retract from the wound, and consequently be less liable to become inflamed, should the external parts have assumed this disposition.*

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* Nerves sometimes ulcerate in consequence of the pressure of tumours, &c. A striking case of ulceration of the sciatic nerve, produced by pressure of an aneurism, which extended backward from the right groin, is recorded by Morgagni, *De causis et sed. Morb.* epist. 50, p. 11.

Tumours of Nerves.

Of all the morbid growths that are found in connection with nerves, tumours are by far the most frequent. They vary considerably both in size and structure, but are commonly a source of acute pain and of the most distressing nervous affections. The smallest kind are known as *painful subcutaneous tubercles*; the larger kind, as *neuromata*. The former are either more or less spherical, or oval, or fusiform, and sometimes rather flattened. Their colour is generally white, but occasionally there is a brownish tint on their surface or in their interior. They are always firm, sometimes hard, and have a fibrous or fibro-cartilaginous structure. Their size varies from that of a millet-seed to that of a pea or a grain of oat. They are situated in the subcutaneous areolar tissue, and are generally more or less embedded between the fibres of the nerves, which are separated and stretched over them. Sometimes, also, they have a close connection with a subcutaneous vein in the neighbourhood of the nerve. They are generally solitary, and mostly confined to the upper or lower extremities, especially the former. Women are more subject to them than men; of eighteen cases collected by Wood, fourteen were women.

It is not easy to determine the cause or mode of origin of these tubercles. They appear in many instances to be the result of chronic inflammation, and have been found to follow certain injuries of nerves, especially contusions. When once deposited, they seem to grow with some rapidity, but may then remain stationary for a number of years.

This small subcutaneous tubercle is a source of the most acute pains, which dart like electric shocks along the course of the nerve, sometimes in both a peripheral and central direction. The pains recur very irregularly, and last, at each attack, from ten minutes to two hours or more. They begin gradually, increase in intensity, and gradually decrease, leaving the tubercle and its surrounding parts more or less tender to the touch. They are frequently excited or aggravated by changes in the weather from hot to cold, or the reverse, by storms, &c., and sometimes by mental emotions. The paroxysms may be repeated several times a day, or there may be remissions of days or even weeks. In many instances the tubercle is not tender to the touch except during the attacks, which are much aggravated by pressure.

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* Swan, *On Diseases of Nerves*, &c., p. 83, 2nd ed.

In all cases of obstinate neuralgia, especially of the extremities, a careful search should be made for the possible existence of tubercles.

Valleix relates the case of a lady who suffered for fourteen years from acute pain in one of her knees, which no kind of treatment succeeded in relieving, until M. Cabaret, on carefully examining the part, discovered a small tubercle about the size of an oat attached to a cutaneous nerve.[*] After its removal the pain entirely ceased. Marjolin furnished Descot with notes of a remarkable case of painful subcutaneous tubercles of the scrotum. A robust man, thirty years of age, had complained, for more than a year, of sharp, lancinating and intermitting pains in the right side of the scrotum and inner side of the corresponding thigh. On examination, he found, in the areolar tissue immediately beneath the skin of the scrotum, several small, smooth, lenticular, movable, hard, and isolated bodies. When compressed between the fingers, they caused the same kind of pains as the patient was accustomed to feel. A small incision of the skin was made over each of them, and they were easily extracted by compressing the edges of the incision. The operation was followed by a complete cessation of the pains.[†]

Neuroma.—Neuromatous tumours, although they differ from each other considerably in size, are larger than the subcutaneous tubercles, and are more variable in structure. They have been found of every intermediate magnitude between a small grain of wheat or oat and a large melon.

Dr. Smith of Dublin, found on the left sciatic nerve of a man who died in the Richmond Hospital, a neuromatous tumour which measured ten inches in its transverse, and eleven inches in its long diameter. The fibres of the nerve were separated from each other, and studded with small oblong tumours.[‡]

Neuromata are either round, oblong, oval, or fusiform. They are situated either between the neurilemma and the nerves, or in the connective tissue between bundles of the nerves. In the former case, the bundles, although pressed together and flattened, are not separated from each other; while in the latter case they are spread out, sometimes in a very regular manner over the surface of the tumour.

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[*] Valleix, *Traité des Névralgies*, p. 563.

[†] Descot, *Dissertation sur les Affections locales des Nerfs*, p. 245.

[‡] *Treatise on the Pathology, Diagnosis, and Treatment of Neuroma.* 1849. Plate ii.

In structure they not unfrequently differ from each other to a very considerable degree. The majority, or those of small and moderate size, are generally solid throughout, although not of uniform density. Sometimes they are exceedingly dense, and have a fibro-cartilaginous and glistening appearance, with a yellowish or greyish tint. They consist for the most part of tough and wavy fibrous tissue, in connection with a variable number of nuclei and small cells. In an interesting case of paralysis of the third cerebral nerve with slow hemiplegia of the same side, from supposed syphilitic disease of the brain, under the care of Dr. Hughlings Jackson, a neuroma of the third nerve, among other lesions, was discovered after death. The description which I gave of the structure of this tumour is applicable generally to neuromata of this kind. 'On examination under the microscope, it was found to be everywhere composed of a multitude of nuclei, with some nucleated cells, and an abundance of fibrous tissue. Some of the nuclei were more or less oval, but the majority were round, and measured about the $\frac{1}{3500}$th of an inch in diameter. Amongst these were other bodies of the same nature, but of all degrees of smaller size, and either elongated, angular, or in the form of granules. The nucleated *cells* were of very small size, and very granular in structure. A few of them were sparingly scattered through the tissue, but, for the most part, they were collected here and there into small, oval, or circular groups. Between these elementary bodies there was an abundance of ordinary fibrous tissue. The fibres were generally more or less tortuous, but parallel, and in their course each divided again and again into finer filaments, which were connected with the cells and with all the other elementary bodies; the granules and the angular or elongated nuclei filling up the interspaces between those that were oval or round; and thus contributing to form with these and the fibres, a close, uninterrupted, and *reticular* structure.'

In other and less numerous kinds of neuroma, the tumour may consist of a single cyst containing a gelatinous fluid, or of a larger mass of ordinary structure containing a number of cysts.*

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* In the Museum of St. George's Hospital (Ser. viii. No. 152) there is a preparation showing a cyst on the median nerve of a patient who had suffered the most excruciating pain in the arm.

Occasionally the tumour has been found to be lobular; the lobules having been connected with branches of the nerve on which the mass was seated, as in a case that will presently be described.

Unlike the subcutaneous tubercles, neuromata grow somewhat rapidly, and steadily enlarge, although they are liable to increase and diminish alternately in size. Their number is exceedingly variable. Sometimes they are solitary, one only being found on a nerve-trunk; sometimes several form on the same trunk, or on the same branches of a nerve; and in rarer instances they form on all or nearly all the spinal nerves in the same individual. Dr. Hughes Bennett states that in the Museum of the Richmond Hospital, Dublin, he examined a most remarkable series of preparations, taken from two individuals in whom almost every nerve of the body presented knotty swellings.* In the case already quoted from Dr. Smith of Dublin, in reference to the enormous neuroma on the sciatic nerve, there were also found on the anterior and lateral regions of the right *lower* extremity, no less than 150 tumours, and about 100 on the nerves of the right *upper* extremity. † In another case described and figured by Dr. Smith, the abdomen and lower part of the thorax were covered with a vast multitude of small superficial neuromatous tumours, which might easily have been confounded with malignant tubercle. ‡

Neuroma may be either traumatic or idiopathic. In the former variety the tumours are caused by wounds, blows, pressure, or by foreign bodies in contact with nerves, or lodged within them. They are generally solitary and solid in structure.

The idiopathic variety appears to be the result of several different causes, viz. chronic inflammation, rheumatism, gout, syphilis, or some other peculiar constitutional vice. Some pathologists believe that the disease is of the nature of scirrhus, but this opinion is not supported by facts. As in traumatic neuroma, there is generally only one tumour, but in some cases, as already shown, the number may be immensely multiplied.

When the tumours are very numerous, there is little or no pain; but a solitary neuroma, whether traumatic or idiopathic, is a source of the most violent agony, which shoots along the nerve like sudden electric shocks; the pain is sometimes continuous, but is always aggravated by pressing or touching the tumour, which seems, during the paroxysm, to be in a state of erythism. Mental emotions and atmospheric changes are also not unfrequently the exciting causes of an attack. After the disease has existed for a length of time, the pain which at first occurred only in paroxysms may become continuous. In idiopathic neuroma, it is more frequently limited to parts below the tumour, while in the traumatic form it may shoot both upwards and downwards. In a few cases on record, the patients were subject to epileptic convulsions, and in two or three they were cured by removing the tumour.

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* Dr. Hughes Bennett, *Principles and Practice of Medicine*, 4th edition, p. 195.

† *Treatise*, plate ii. This is apparently one of the cases mentioned by Dr. H. Bennett.

‡ *Treatise*, p. 17, plate vi.

John Hunter removed from the musculo-cutaneous nerve, one about the size of a hen's egg, over which the fibres of the nerve were spread out. Sir E. Home removed from the axilla of a Frenchman, a hard oval tumour about three inches and a half long, and two inches broad. It was enclosed between fibres of one of the large nerves of the axillary plexus, and was the cause of terrible suffering. Louis removed from the fore-arm of a young lady, a tumour which made its appearance fourteen years back, as a small hard substance midway between the bend of the arm and the hand. At the time of the operation it had so much increased in size, that it extended over the whole front of the fore-arm, and was about six inches in diameter in the middle. The pains increased in severity in proportion to its growth. On examination after its removal, it was found to consist of several lobes, which were connected by pedicles to branches of the radial nerves, like grapes to their stalks.*

The exciting cause and mode of origin of these tumours are often exceedingly obscure; but not unfrequently they may be traced to external injuries, particularly to blows and contusions. Cases of this description are recorded by Sir C. Bell,† Dupuytren,‡ and others.

When the neuroma is superficial, the diagnosis is by no means difficult. In general the tumour is movable laterally, but cannot be moved in the direction of the nerve without causing great pain. In most cases the skin which covers it remains unaltered, but when the tumour is very large the cutaneous vessels, especially the veins, are sometimes dilated.

The only effectual remedy for these morbid growths is the knife. The operation may consist either of excision of the tumour, with or without a portion of the nerve, or of amputation of the affected limb. When the neuroma is very intimately connected with the nerve, and there is reason to believe that it cannot be extricated from the nerve without great disturbance or injury, it is better to remove a portion of the nerve with it. With regard to the sciatic nerve, which supplies the whole of the limb, excision of a portion of its length would be attended with serious consequences, and therefore unless the tumour be confined to that portion of it which forms the posterior tibial nerve, and the peroneal nerve can be saved, it would probably be advisable to amputate the limb.

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* Delaroche et Petit-Radel, *Encl. méd.*, art. 'Tumeur.'

† *Operative Surgery*, vol. ii. p. 161.

‡ Apud Valleix, loc. cit. p. 328.

Tubercle. — Dupuytren and Cruveilhier have spoken of tubercle in nerves, but there appears to be no evidence to prove that it is ever found in this situation as a primary disease; although nerves are sometimes destroyed by the softening of tubercles in which they are involved.

Cancer, unlike tubercle, is frequently met with in nerves, both as a primary and secondary affection. The form of the cancer is in general either the white medullary, or melanosis. It may occur at any part in the course of a nerve, but it is mostly found near its peripheral extremities. It generally grows to a considerable size, as in medullary cancer of the retina. As a secondary disease it is communicated to the nerve by a contiguous cancerous growth.

Dubois, on several occasions, found cancerous growths in the substance of nerves of both the arms and legs.* Moutard-Martin saw one on the median nerve, and its removal was followed by cancer of the brain. Dupuytren removed one from the posterior tibial nerve, which, moreover, presented a series of nodulations, like grape-stones. It was the cause of acute lancinating pains. In another case he found the trifacial nerve transformed into encephaloid substance.† Cancerous growths have been found, also, on separate branches of the trifacial, on the spheno-palatine ganglion, on the optic nerves, and on the phrenic nerves.‡

Hypertrophy of nerves, in the proper sense of the term, has no actual existence as a *morbid* condition. It is true, as we have already seen, that the inflamed portion of a nerve frequently increases considerably in size; but this increase is the consequence of morbid products and exudations that are poured into the neurilemma and connective tissue between its fibres, which instead of being multiplied or enlarged, sometimes undergo, from compression and impaired nutrition, decided wasting and disintegration.

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* Viel-Hautmesnil, *Considérations générales sur le Cancer.* Paris, 1807.

† Breschet, *Dictionnaire de Médecine*, art. 'Cancer.'

‡ Descot, *Sur les Affections locales des Nerfs.*

Atrophy of nerves may be either general or local. General atrophy is found only in cases of extreme and protracted emaciation, from defect of general nutrition. Local atrophy may be the result of several different causes, viz., chronic inflammation, stretching, compression, and even severe contusions. Of these the most common is compression caused by tumours, aneurisms, enlarged glands, &c. Nerves of special sense often waste after loss or wasting of the central organs to which they belong, as the optic nerve after wasting of the globe of the eye. In some instances the nerve-fibres only are implicated, and nothing may be left but the neurilemma; in others the neurilemma itself is involved in a greater or less degree. During the process of atrophy, the nerve-fibres become uneven; their white substance is broken, at intervals, and stripped from their axis-cylinders in masses, which again break up into smaller fragments that are mingled with fatty particles.

INJURIES OF NERVES.

Contusions of nerves are frequently followed very insidiously by the most serious consequences. If the blow be not very severe, the principal change produced in the nerve is the extravasation of blood and other fluids into the connective tissue between its bundles. There are pain, numbness, tingling, or formication in the parts supplied by its branches, followed, in a greater or less degree, by partial and temporary paralysis, and atrophy of the muscles. If the contusion be very violent, the fibres of the nerve may be lacerated or crushed, and then the atrophy and paralysis are of a much more serious character, and may follow the injury either immediately, or not till after an interval of weeks or even months.* As we have already seen, tumours are liable to form on nerves that have been contused.

Compression and distension of nerves are frequently the results of a great variety of causes. Of these, dislocation of large joints, and the attempts made at reduction are among the most common. The effects are more serious in proportion to the length of time before the dislocation is reduced. Sensibility suffers much less than the power of motion. If compression of a nerve be severe and long continued, it may give rise to incurable paralysis and wasting of muscles. When the injury is not so severe, it causes pain of a more or less acute, and more or less constant, character, attended sometimes with a feeling of numbness or tingling. Nerves may be compressed, also, by aneurisms; by tumours of different kinds formed either upon them, or in their immediate neighbourhood; by enlarged glands or bursæ; by abscesses; by cancerous growths; by fæcal distension of the rectum and sigmoid flexure of the colon; by hæmorrhoids and other causes.

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* Several interesting cases, showing remarkable consequences of contused wounds of the scalp, are recorded by Pouteau, *Œuvres posthumes*, tome ii.

Sir B. Brodie relates the interesting case of a man who had severe pain on the inside of his knee. No marks of disease could be detected in the joint, but in the thigh there was an aneurism of the femoral artery. Sir E. Home applied a ligature round the artery in the upper part of the thigh; the tumour immediately ceased to pulsate, and the pain in the knee ceased also.* The remarkable case related by Morgagni, of aneurism of the right groin pressing on the sciatic nerve and producing ulceration with intense pain, has been already quoted. Scarpa also describes an interesting case of aneurism of the abdominal aorta, causing disorganisation of the lumbar nerves and injury to the anterior crural and obturator nerves.†

Tumours in the immediate neighbourhood of nerves are frequently, by the pressure which they exert, the cause of as much suffering as those which are formed upon them.

Sir B. Brodie mentions the case of a gentleman who suffered severe and increasing pain in the left leg, from the foot to the knee, in the course of the peroneal nerve. As the limb presented no morbid appearance, the disease went by the name of neuralgia. After a considerable time the patient died of dropsy, and on opening the abdomen, a large solid tumour was found attached to the left side of the lumbar vertebræ. It was evident that this tumour must have pressed on the origin of the sciatic nerve.‡ Mr. Travers published an interesting case of compression of nerves by a medullary tumour in the ham;§ and Sir William Lawrence mentions the case of a tumour in the fore-arm of a gentleman, situated over the course of the ulnar nerve, and causing exquisite pains, like electric shocks, upwards and downwards, in the direction of the nerve.[*] Mr. Morris has recorded a most remarkable case of ungovernable satyriasis, excited apparently from pressure on the internal pudic nerve made by a tumour that arose from a blow on the perinæum.[†]

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* *Works*, vol. iii. p. 135.

† *Treatise on Aneurism*, translated by Wishart, p. 99.

‡ *Works*, vol. iii. p. 135.

§ *Med.-Chir. Trans.* vol. xvii. p. 389.

Tumours of this description are liable to be mistaken for neuromata, or for those tumours which are formed on nerves or in their substance; but a correct diagnosis may generally be made by moving the tumour in different directions. If the tumour be free, pain will be felt only when it is pressed in the direction of the nerve.

Enlarged glands are not unfrequently the cause of compression and distension of nerves; and there is no nerve so frequently affected in this way as the facial. Several cases of this description were published by Sir Charles Bell.[‡]

Sir B. Brodie mentions a case in which 'two lymphatic glands, enlarged to the size of large walnuts, were found situated beneath the skin, on the anterior part of the thigh.' A considerable branch of the lumbar nerves lay over each of these glands, being thus kept stretched like strings of a violin over its bridge, and giving rise to violent pain and convulsive movements of the leg.[§]

The same author mentions a case of severe neuralgia in the foot, caused by the descent and pressure of internal hæmorrhoids, after each evacuation from the bowels.[‖] Romberg calls particular attention to neuralgia of the obturator nerve caused by crural hernia, and gives a long but interesting case in illustration.[¶]

Pain of a very acute kind is more often excited by small interstitial growths in nerves than by large tumours over which the nerve-fibres are stretched; for nerves may be stretched to a very considerable extent without exciting any painful sensation, until they become inflamed, or their nutrition be impaired, when the slightest touch causes acute pain. It therefore seems highly probable that the painful effects of compression and distension, by whatever means they may be produced, are in many instances the result of inflammation or some peculiar kind of irritation which has been excited. When nerves are bruised or otherwise injured at their exit from a foramen or bony canal, they are very liable to cause suffering, because in the event of inflammatory swelling, they are sure to be compressed.

Laceration of nerves occasionally takes place from different kinds of causes, such as accidents by machines, heavy falls, fractures of bones, dislocation of joints and attempts at reducing them. It is somewhat surprising, that, except in parts that are vitally important, laceration of nerves is not followed by serious consequences so often as might be expected.

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[*] Ibid.

[†] *Trans. of Medical Society of London*, vol. i. part i. p. 174.

[‡] *Nervous System*, appendix.

[§] *Works*, vol. iii. p. 139.

[‖] Ibid. p. 141.

[¶] Romberg, *Nervous Diseases of Man*, vol. i. p. 75.

Béclard has related many cases of this description.* Flaubert mentions a case in which the last four nerves of the brachial plexus were torn from the spinal marrow, by violent extension in attempting to reduce a dislocation of the shoulder-joint. The patient died at the end of eighteen days.† In St. George's Hospital Museum,‡ there is a preparation showing the anterior root of one of the cervical nerves torn from the spinal cord, by dislocation of the vertebræ in a heavy fall.

Ligature of nerves.—It sometimes happens that in tying an artery a nerve is accidentally included in the ligature. In certain cases this accident has been followed by severe local and constitutional disturbance, and even by fatal effects. Many instances of tetanus resulting from the same cause, after amputation, have been recorded by several writers. When pain is referred to the amputated limb along the distribution of a particular nerve, there is reason to believe that this nerve has been included in a ligature; and if on pulling at the ligature the pain experienced be aggravated, there can be no longer any doubt as to its cause. Under these circumstances, if tetanus, or any other alarming constitutional disturbance be threatened, the ligature should be immediately removed.

Hennen gives a most interesting account of the effects of ligatures on nerves, in the case of a general officer who suffered amputation of an arm, which was destroyed by a bullet in action. After the occurrence of fever and extensive sloughing, an attempt at clearing the ligatures was attended with the most excruciating pain. 'He has,' says Dr. Hennen, 'frequently, after the smarting of dressing was over, with great accuracy pointed out on my arm the course of the internal cutaneous nerve, as the site of his ideal pain; often he has described that of the external; and on one occasion, I, with utter astonishment, had the general neurology of my arm and fingers traced by him. Once only did I ever know him to refer his pain to the sensorium itself. On that occasion, from using an artery forceps to the ligature, on which the slide moved rather stiffly, I exerted a greater force than I intended. He convulsively put his hand to his head, expressed a sense of exquisite pain in his brain, involuntary tears dropped from his eyes, a paralytic contraction momentarily affected his mouth, an universal paleness spread over the uncovered part of his body, and he uttered a piercing cry, exclaiming that the agony of his head and mouth was insufferable. The state of collapse was so great, that I was obliged to send an aide-de-camp instantly for volatile alkali and a glass of Madeira, by which he was soon relieved; but the painful sensation, and the prostration of his strength continued through the day.' *

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* Béclard, apud Descot, *Affections locales des Nerfs*, p. 41.

† Flaubert, 'Mémoire sur plusieurs cas de Luxation, etc.;' *Répert. gén. d'Anat. et de Phys. pathologiques*, 1827, vol. iii. part i. p. 102.

‡ Series viii. No. 131.

Complete division of nerves.—The effects of complete division, as of other injuries, of nerves, vary considerably in different individuals, according to peculiarity of diathesis, or even in the same individual at different times, according to the state of the general health, and other accidental circumstances. In a healthy person, when the external wound heals kindly by the first intention, no remarkable pain or unusual consequences are experienced. Both portions of the divided nerve retract a little, and their extremities, especially the upper one, enlarge and become more vascular, while coagulable lymph exudes around and between them. In a short time this exudation becomes gradually firmer, and is found to contain cells and nuclei, and then fine nerve-fibres, which proceed from the extremity of the central portion of the nerve to that of the peripheral portion, which, on being separated from its nervous centre, undergoes a gradual atrophy or degeneration. These newly-formed fibres are finer and greyer than those of the central portion of the divided nerve, and it is not till after a period of some months, that they become fully developed. In the meantime a regeneration of fine fibres is going on in the peripheral or atrophied portion of the nerve; but it is a long time before these fibres acquire the normal size and appearance. The same kind of reparative process takes place when a portion of a nerve has been excised, only it occupies a longer period.†

When the external wound, instead of healing kindly by the first intention, becomes irritable and inflamed, the ends of the divided nerve participate in the inflammation, and give rise to violent pain, spasmodic contraction of muscles, and other severe symptoms. This is what sometimes occurs after amputation when the stump inflames.

Mr. Langstaff has related an exceedingly interesting and instructive case of this description.‡ After amputation at the fore-arm in a female, the stump did not unite favourably, and she suffered the most distressing agony, which so affected her health, that she became extremely nervous. 'There was a constant state of convulsive action of the muscles of the stump. Everything that could be done to improve her health and relieve pain was fairly tried for several months, without the least good effect. She was hysterical, and the paroxysms were frequent.' After the stump had healed, a pulsation almost aneurismal could be felt in the situation of the ulnar and radial arteries. Having seen, in several cases, symptoms similar to those caused by the extremities of the nerves becoming ganglionic, and a second operation rendered requisite, Mr. Laugstaff removed the arm above the elbow-joint, and previous to securing the arteries, drew out each nerve to the extent of half an inch from the surface of the stump, and cut through them to prevent their interrupting the progress of cicatrisation of the integumental parts. The patient was relieved of all her painful sensations, a good stump was made, and her health improved. On examining the amputated part, the median, radial, and ulnar nerves were found remarkably large. The extremities of the two latter were greatly increased by deposition of organised lymph.

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* *Military Surgery*, p. 191.

† The process by which divided nerves are reunited, has been recently investigated by J. Müller, Stricker, Steinrück, Nasse, Günther, Schiff, and especially Vulpian. (*Physiologie générale et comparée du Système nerveux, douzième leçon.* 1866.)

‡ *Medico-Chirurg. Trans.* vol. xvi. p. 140.

Sometimes, after the complete cicatrisation of the external wound by which a nerve has been divided, the cicatrix becomes inflamed, and the nerve participating in the inflammation may give rise to the most acute pain, particularly when the part to which it belongs is put in motion. In other cases one or both ends of the divided nerve may be involved in the cicatrix and be the cause of the most severe suffering. The position of the cicatrix is sometimes important, as when it happens to cross at a right angle the tract of a large nerve which is so related to it as in certain positions of the limb to be pressed against it, causing pain and even loss of motion.

Incomplete division of nerves is, in general, productive of much severer consequences than when the division is complete. If nearly the whole thickness of the nerve be divided, the free portions will retract and put the undivided portion on the stretch; but except in peculiar constitutions, under unfavourable conditions, or when the nerve becomes inflamed, this tension does not in general appear to give rise to serious results. Sir Astley Cooper, in removing a tumour, cut away two-thirds of the thickness of the median nerve. Tingling of the fingers, with some partial numbness, ensued, but nothing more.* But partial division of nerves occurring in persons of a peculiarly nervous, irritable, or hysterical constitution, is frequently a cause of the most distressing local and general symptoms.

Punctures made with different kinds of pointed instruments are the most common instances of this species of injury to nerves. The first symptom which ensues is generally acute pain at the injured part, coming on most frequently at the time of the accident, and darting along the course of the nerves either towards their peripheral extremities or in the opposite direction towards the spinal cord and brain. It is sometimes periodical in its attacks, and attended with redness, tingling, or more or less numbness and swelling of the part. Contractions of the limb, violent spasms or tremors of the muscles, trismus, and even epileptiform convulsions, are not uncommon, and in females hysterical excitement is a frequent consequence. After a time, if the symptoms continue severe, the spirits become depressed, there is more or less prostration of strength, and, in some cases, delirium and coma supervene. The pain is often reflected on to other nerves with which the injured nerve is connected only through the nervous centres, and this sympathetic influence is sometimes experienced to a surprising and terrible extent.

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* *Lectures by Tyrrell*, vol. iii. p. 171.

Mr. Wardrop has related the case of a woman who pricked the forefinger of her right hand, near the point, with a gooseberry thorn. The wound was immediately followed by great pain, swelling and redness, which in a few days extended along the forefinger and adjoining phalanx of the middle finger. At the end of three months the pain and swelling disappeared, except from the two first phalanges of the wounded finger, which remained extremely painful. The patient's general health suffered considerably, and she had severe nervous paroxysms two or three times a day, during which the pain extended along the finger to the back of the hand, and between the two bones of the fore-arm, darted through the elbow-joint, and up the back of the arm to the neck and head, producing a sensation at the roots of the hairs as if they had become erect. To these symptoms succeeded dimness of sight, and subsequently the pain extended to the stomach, producing nausea and vomiting. She had constantly the feeling of a lump in her stomach, and vomited after taking food or drink. At the end of seven months, three incisions were made at the point of the finger, but they gave her no relief. She was afterwards completely cured by amputation of the finger.*

A case in which the most violent effects arose from the puncture of a nerve during the operation of bleeding, was related to Mr. Swan by Dr. Wilson of Grantham. The patient, who was a woman, had been bled by a gardener. On the second day she fell into strong convulsions, and some time after became comatose. The median vein in which she was bled had not healed, and was somewhat inflamed. An incision was made just above the orifice of the vein, when the patient immediately cried out, 'I am well; I can stir my arm.'

Even fatal effects occasionally follow the puncture of a nerve during the operation of bleeding. Such a case is recorded by Bonetus.†

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* *Medico-Chirurg. Trans.* vol. viii. p. 246. Sir B. Brodie has described a case of the same kind, occurring in a young lady eleven or twelve years of age (*Works*, vol. iii. p. 170).

† *Sepulchretum*, tom. ii.

Incised wounds of nerves are frequently the cause of the same kind of symptoms as those produced by puncture.

Hamilton relates the interesting case of a girl, aged seventeen, and of nervous temperament, who, while cutting bread, wounded the septum between the thumb and forefinger of the left hand. The pain from the first was very severe, became still more so, and extended to the thumb, forefinger, back of the hand, up the forearm, inside of the arm to the axilla, shoulder, and side of the neck. These and other symptoms continued for nearly three months after the external wound had healed, when she got a fright in the street, and fell into an hysterical fit. After two days of hysterical symptoms, all pain and swelling left the arm and never returned.*

This interesting case is a good illustration of the remarkable influence of hysteria in aggravating the effects of local injuries, and affords an example of the singular manner in which these effects are removed by sudden emotions of the mind. Sir B. Brodie, who paid so much attention to this important subject,† justly observes, that when the patients are subject to hysterical paroxysms, sometimes the paroxysms cease on the appearance of the local symptoms, and sometimes, on the contrary, a recurrence of the former is followed by an abatement of the latter, or by complete recovery from them.

He mentions the case of a young lady, who having long suffered from hysterical neuralgia of the hip-joint and thigh, was entirely cured of all her symptoms on being thrown from a donkey.

I knew the case of a girl, who, while suffering from complete hysterical paraplegia, jumped up in a fright, on seeing a mouse run across the room, and was cured from that moment.

For an important case of incised injury of nerves, of which the following is the substance, we are again indebted to Mr. Wardrop.‡ A young gentleman cut the distal phalanx of the left thumb obliquely across the radial side with a gun-flint. The wound readily healed, but on the patient living freely, in a few days the thumb became painful, and although no change in its appearance could be perceived, and the cicatrix seemed perfectly natural, the pain extended to the forefinger, the radial side of the middle finger, and up the arm as far as the neck and side. The pulse was frequent and tense, the face flushed, and the tongue white and frothy. Copious general bleeding gave almost immediate relief. The symptoms, however, returned and yielded to another bleeding, with copious purging. The paroxysms of pain were several times distinctly produced by mental excitement, and on some occasions were brought on by taking even a small portion of animal food. The wounded thumb, which was at all times painful and extremely tender to the touch, was sometimes seized with paroxysms of agonising pain, which was no longer confined to those fingers supplied by the radial nerve, but extended over the whole hand, arm, neck, and even down the back. Mr. Wardrop divided the injured nerve, with complete abatement of all the symptoms. The success, however, was not permanent, for during several weeks after the operation, whenever he took food of difficult digestion, when purgatives did not readily operate, or when his mind was at all excited, the pain attacked his hand and arm, sometimes severely. After that time he completely recovered. The point of the thumb, however, always remained numb, but whenever the patient's stomach was disordered, he felt pain in the thumb.

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* *Dub. Med. Journ.* vol. xiii. case iii. p. 42.

† 'On Local Nervous Affections, and Local Hysterical Affections,' *Works*, vol. iii.

‡ *Medico-Chirurg. Trans.* vol. xii. p. 205.

This interesting case has several points worthy of particular observation. It affords a good example of acute inflammation excited in a recently injured nerve by a too early use of the part which it supplies, by an incautious mode of living, or by mental excitement. We also see not only that the pain—or rather the irritation exciting the pain—was reflected from the injured nerve to other and even distant nerves with which it is connected only through the medium of the nervous centres, but that even after the connection of the injured portion of the nerve with its nervous centres had been interrupted, pain was still excited in the other nerves by accidental causes. Indeed, in very severe or long-standing cases of traumatic neuralgia, there is reason to believe that the nervous centres in which the injured nerves are implanted, are sometimes secondarily and permanently deranged or diseased, and in this way become the source not only of neuralgia, but even of paralysis in other and distant parts. Among other cases that might be mentioned, one important case of complete division of a nerve, recorded by Mr. Swan, appears to be of this nature.

A young lady, aged twenty-three, on December 20, 1822, wounded the ulnar side of the second finger of the left hand, near the middle of the second phalanx, while cutting an orange. The pain extended to the centre of the left breast, and up the left side of the neck to the face, along the branches of the facial portion of the seventh (?) nerve. On the sixth day after the accident the wound had entirely healed, but was extremely tender. The pain was excruciating when she attempted to move the arm with the hand in a state of pronation. Whenever she read, pain was produced in the superciliary nerves of the left side, after about five minutes. As the patient's health was suffering, on January 11, 1823, Mr. Swan divided the digital nerve near the middle of the first phalanx. She was immediately and completely relieved, and could move her arm in any direction without pain; but as the effects of the operation were not permanent, on March 5 the finger was amputated at the joint between the metacarpal bone and the first phalanx, and on examining it at the original wound, a small fibril of the digital nerve was found divided; the end of this next the tip was found incorporated with the cicatrix; the other was formed into a small bulb.

At the place of the division of the nerve at the first operation, both its extremities were incorporated with the cicatrix, as were those of the dorsal branch, which had also been divided. Although her local and general symptoms were much relieved by the operation, she continued to feel pain in the hand, arm, neck and face, and about four months later (in July), she began to complain of her spine. About the end of November she complained very much of pain in her back, with tingling in her arms, and a difficulty of supporting herself erect. Percussion along the spine produced uneasiness in every part, and much pain about the lower dorsal vertebræ. Some time after, she was seized with violent pain in the left knee, which lasted for two or three days. Pressure on each side of the spinous processes of several of the vertebræ produced pain, and percussion with a key made it very severe. She had difficulty in voiding her urine. In October 1824, she complained of numbness and loss of sensation in the left hip and shoulder, and of pain at the back of the neck, with a feeling as if the neck could not support the head. At the latter end of the year 1825 and beginning of 1826, she was affected by dizziness, in fits of which she fell down, but never entirely lost her consciousness. Her left arm and leg were weaker than the right. When the membrane lining the left external auditory meatus was touched, cough was produced. Up to March 1829, she had varying degrees of pain and weakness, soreness in the throat with an appearance of venous congestion, and disorder of the digestive organs, with great tenderness in a spot about the size of half-a-crown at the pit of the stomach. She had also some pain and swelling about the uterus and vagina. When sleeping on her left side she very frequently awoke with pain in the amputated finger. Tic douloureux was brought on by either exciting or depressing emotions, by exposure to strong light, and by fits of sneezing, with which she was frequently troubled. When Mr. Swan last saw her on October 30, 1833, she was nearly in the same state as she had been in for a long time; but we are left in ignorance of the subsequent course of the disease. The patient's father had a paralytic attack.*

Here, then, we have an instance of very extensive neuralgia, of incomplete but extensive paralysis, and other severe symptoms, extending through a period of ten years, as the effects of simple division of a nerve of one of the fingers. That these morbid symptoms arose out of some peculiarity of constitution, there can be no doubt; and it seems highly probable that this peculiarity was of an hysterical character.

Foreign bodies embedded in a nerve or pressing against it are often the exciting cause of violent pains and other symptoms similar to those which result from wounds.

Jeffries relates the case of a girl who suffered from violent and almost continual neuralgia of the face for fourteen years. A hard, pointed substance was felt under the skin of the right cheek, and at this point the slightest touch brought on an attack of pain. An incision was made, and a triangular piece of a china cup removed, with complete cessation of the neuralgia.

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* Swan, *Diseases, &c. of Nerves*, 2nd edit. p. 129. Of this remarkable case I have given the briefest possible abstract of the most salient and important points, but the details, which are very full, deserve attention.

One of the most interesting and remarkable cases of this description is related by Denmark.* A young soldier was wounded by a musket-ball which entered the triceps extensor cubiti, about one inch and a half above the inner condyle of the os humeri, grazing the inner side of that bone, and passed obliquely downward through the brachialis internus, and out anteriorly through the bend of the arm. The wound soon healed without exciting any particular morbid symptom. The man was subsequently admitted into Haslar Hospital, with excessive pain, frightful dreams and startings. The fore-arm was always bent and in the supine posture. A small tumour could be felt in the site of the wound on the anterior part of the arm, which he could not bear to be touched. The pain began at the extremities of the thumb, and all the fingers except the little one, and extended up the arm to the part wounded. It was a burning pain, and so violent as to cause a continual perspiration from the face. Neither opium nor any other means employed assuaged his intense sufferings. At his own request, the arm was amputated, with immediate relief, and he was discharged cured in three weeks. On examining the amputated arm, the radial nerve seemed to be blended with, and intimately attached to, the wounded parts, for the space of an inch. It had itself been wounded, and at the place of the injury, was thickened to twice its natural diameter, and seemed as if contracted in its length. On further examination, Dr. Denmark was surprised to find, in dividing the fibres on the posterior part of the wounded nerve, that there was a small portion of the ball firmly embedded in it, which had been driven off by grazing the bone.

Treatment of injuries of nerves.—When an incised or other open wound is accompanied and followed by very acute pain, by more or less numbness, and by partial or complete loss of sensation and motion in the part beyond the wound, we may conclude that a nerve has been either injured or divided. Under these circumstances it is of primary importance to remove all dirt or other foreign bodies that may be present, to promote healing by the first intention, and enjoin perfect rest. If these precautions are not adopted and the external wound inflames, the nerve is liable to participate in the inflammation, and may then become the source of the violent and distressing symptoms already described. When this is the case it may be necessary to apply leeches to the neighbourhood of the wound, to use either cold lotions or warm fomentations of poppies, and poultices, and to act briskly on the bowels by means of purgatives. When the inflammatory symptoms run high and the constitutional disturbance is considerable, I have seen the most decided benefit derived from a combination of tartarated antimony, opium, and hyoscyamus, given at short intervals, the antimony being in sufficient quantity to keep up a state of great nausea.

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* *Med.-Chirurg. Trans.* vol. iv. p. 48.

In some cases, after all inflammatory action has subsided and the external wound has completely healed, painful and distressing symptoms may still persist at intervals for a very considerable period; and in other cases where the external wound has healed at once in the kindliest manner by the first intention, similar symptoms may supervene. Most of these latter cases are females of a more or less hysterical constitution. But, as we have already seen, there are other causes besides hysteria, such as pressure, dragging, or inflammation of a cicatrix; a premature use of the limb—that is, before the nerve is sufficiently repaired or united; and while the nerve is in this state, it is in some cases very susceptible of irritation by errors in diet, intemperate habits, mental emotions and influences of the most trivial nature. One part of the treatment will of course consist in avoiding or removing the exciting cause, if this can be ascertained. When the cicatrix presses on the nerve, active frictions with moderate exercise of the part will relieve the pain. If it be simply painful or tender, the application of belladonna will frequently allay the irritation; or if it appears to be inflamed, the removal of a little blood by means of two or three leeches may be necessary. If pain and tenderness be experienced in the course of the nerve, repeated leeching, or blistering, and sometimes actual cautery will afford relief. In cases of that intense *burning* pain which is sometimes so agonising in nerve-wounds, there is no treatment so successful as repeated blistering. The painful state of the parts to which the wounded nerve is distributed may be treated by the local application of anodynes, such as chloroform, aconite, opium, and belladonna; and the most effectual mode of using the two latter substances, is by subcutaneous injection. Mr. Pearson * has recorded a very remarkable case of neuralgia, which, after resisting every kind of treatment, yielded at length to the application of a stimulating embrocation that was rubbed into the part for ten minutes twice or three times a-day.†

In some instances when every other remedy has failed, the happiest effects have resulted from the use of mercury exhibited for a period sufficiently long to affect the gums. Mr. Hamilton

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[*] *Medico-Chirurg. Trans.* vol viii. p. 252.

[†] ℞ ol. olivæ, ℥ijss.; terebinth, ℥jss.; acid. sulph. ʒjss. M.

has recorded two cases of this description.* In many instances, however, in which this remedy has been employed, it has completely failed.

In extreme cases, when all other resources are exhausted, it becomes a question whether the nerve should be divided or a portion of it excised, or whether the member which it supplies should be amputated. If the constitutional disturbance be of an alarming character, there should be no hesitation in at once dividing the nerve, or excising a small portion; for these operations have been frequently followed by an immediate arrest of all the symptoms, as in Dr. Wilson's case already mentioned.†

In a case of contused thumb followed by violent symptoms, Sir Astley Cooper removed five-eighths of an inch of the radial nerve with complete success. Mr. Sherwin relates the case of a servant-maid, who suffered from the most alarming symptoms after the operation of venesection. At the end of a fortnight she was cured by a deep incision above the cicatrix.‡ A similar case with the same result is recorded by Dr. Watson.§ Mr. Earle excised about half an inch of the radial nerve, for punctured wound of the thumb followed by pain, spasm, temporary trismus, &c., which had lasted for two months. The patient was soon relieved, and after some months completely cured.

In many instances in which division of the nerve has failed, amputation has been performed with complete success, as in the case of Mr. Wardrop.‖ A still more decided example is recorded by Mr. George Bell.¶ A lady, twenty-six years of age, while cutting a loaf of bread, injured the nerve of the thumb, on the radial side. The wound healed kindly, but was followed by excruciating pain and other violent symptoms. Two years after, on two different occasions, an incision was made through the soft parts to the bone, in the neighbourhood of the wound, but with only temporary relief. Mr. Bell removed the thumb at the second joint, and in five or six weeks she was restored to perfect health.

However, in some cases, especially of females of marked hysterical constitution, neither the division of nerves nor amputation is of any permanent benefit; while in others which have resisted every kind of treatment except by operation, a spontaneous cure has occasionally been effected.

When nerves have been contused or compressed, without becoming inflamed, the best kind of treatment consists of the repeated use of exceedingly hot fomentations, frictions with stimulating embrocations, and Faradisation. But if tenderness and pain be felt in the course of the injured portion of the nerve, it will be necessary to apply leeches, cold lotions, and blisters, and to insist on perfect rest.

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* *Dublin Medical Journal*, vol. xiii. pp. 41, 48.

† See p. 165.

‡ Duncan's *Medical Commentaries*, vol. iv.

§ *Medical Communications*, vol. ii. p. 251.

‖ See p. 165.

¶ *Edinburgh Journal of Medical Science.*

NEURALGIA.

It has been already seen that a large proportion of neuralgic cases are due to traumatic irritation or inflammation; that some are the result of idiopathic inflammation, in either an acute or chronic form; that others are the consequence of ulceration; of compression and irritation caused by aneurisms, by enlarged glands, by tumours, &c., either in the neighbourhood of nerves or in their substance. Moreover, neuralgia of the tri-facial nerve has in some cases been found to depend on disease of the bones of the head and face. In the case of the late Dr. Pemberton, the frontal bone was thickened; and in the falx cerebri, there was an osseous concretion.* Sir H. Halford found hypertrophy and other morbid states of the cranial and facial bones, such as exfoliations of the antrum, considerable thickening of the frontal, ethmoid, and sphenoid bones. Dr. Bright relates an interesting case of facial neuralgia in which he found fungoid tumours of the brain and disease of the cranial bones.† In some instances the disease of the bone is the result of syphilis, which also attacks the nerves themselves, not only in the head but in all other parts of the body.

Many cases of neuralgia have a gouty or rheumatic origin; but there are others that do not depend on any of the causes above mentioned, and in which, when there has been an opportunity of post-mortem examination, no appreciable alteration has been discovered in the nerves. Yet that some peculiar, but perhaps only periodical, change takes place in the tissue either of the nerve itself or of the nervous centre from which it arises, there can be no question; for to speak of functional disorder without some material change, is to speak of an effect without a cause. In some instances, the exciting cause appears to act directly and immediately on the nerve-tissue, as in cases of neuralgia resulting from atmospheric changes, particularly from electric states of the atmosphere. In other instances, the effect may be produced through the medium of the circulation, by malaria and blood-poisoning of different kinds. Anæmia, again, especially in females, is among the most common causes of neuralgia; as is also hysteria, even when unattended by anæmia. Disorders of digestion, constipation, the sudden suppression of secretions, or of habitual hæmorrhages, such as hæmorrhoids, the catamenia, &c., may all be productive of neuralgia in persons already predisposed.

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* Travers, *A Further Inquiry concerning Constitutional Irritation, and the Pathology of the Nervous System*, p. 351. 1835.

† *Reports of Medical Cases*, p. 506.

The points of diagnosis between this form of neuralgia and that which arises from neuritis or inflammation of nerves, are very important, because the treatment required is very different in the two kinds of cases. In non-inflammatory neuralgia, although the pain may be excited or aggravated by the slightest touch, it is generally relieved by firm pressure, which is not the case in neuritis. Moreover, the pain is always interrupted by remissions of variable length in different cases, and is extremely varied in its character. It begins and ceases suddenly, and is apt to shift from one branch of a nerve to another, with a rapidity and intensity which are never experienced in neuritis. Antiphlogistic treatment, which relieves the latter, frequently aggravates non-inflammatory neuralgia.

NUTRITIVE AND OTHER CHANGES RESULTING FROM INJURIES AND DISEASES OF NERVES.

(1) *Changes due to Injuries of Nerves.*

In the earlier part of the present century a few observers occasionally and incidentally noticed the morbid effects of injuries of nerves on the nutrition of certain tissues; but it is only within the last ten or twelve years that the subject has been systematically studied. These lesions of nutrition consist chiefly of,

(*a*) Diminution of temperature in the parts to which the injured nerve is distributed.

(*b*) Cutaneous eruptions, ulcerations, and alterations in the colour and texture of the skin, and its appendages.

(*c*) Increase or diminution, and alterations in the quality, of its secretions.

(*d*) Periodical swelling of joints and other parts of a member.

(*e*) Atrophy and contraction of muscles supplied by the injured nerve, with distortion and stiffness of joints.

(*a*) The effects of injuries of nerves and of nerve-centres on the temperature of paralysed parts was well investigated in the early part of this century by several English observers, particularly by Earle and Yelloly.

Earle excised a portion of the ulnar nerve of a girl for severe neuralgia, and five years after he found the temperature of the paralysed parts decidedly diminished. He also found that they were unable to resist the injurious effects of cold. Frosty weather produced blistering and ulceration of the little finger.* Yelloly mentions a case of anæsthesia, in which similar effects were produced by warmth.†

Mr. Jonathan Hutchinson, in a valuable and interesting article on 'Injuries to Nerve-trunks,'‡ observes that the parts paralysed by division of the nerve which supplied them, could never, even in the warmest temperature, be raised to that of adjacent, unparalysed parts. 'Nor does even the existence of active inflammation raise the part to the normal standard, although it much increases it.' 'It would appear, therefore, that while a paralysed part can be cooled to almost any extent, it cannot be raised by artificial heat beyond a certain point, and that point much below the maximum of its uninjured counterpart.'

(*b*) Romberg, more than thirty years ago, very clearly described some of the most important nutritive changes that the skin and its appendages undergo, when deprived of the proper supply of nerve-influence. There is found, he observes, an increased branny or scaly desquamation of the epidermis, accompanied by an absence of transpiration. The nails curve in, they become rough and ragged, and fall off.

He mentions a case of Dieffenbach's, in which there had been violent pain for ten years in the right foot. On the outer and posterior side of the thigh, near its middle, there was a tumour about five inches in circumference, which was also painful, and, when pressed, augmented the pain in the foot. The tumour was removed in 1836, and Romberg saw the patient two weeks after. There was complete anæsthesia in the parts supplied by the peronæus and tibialis nerves. The muscles of the leg and foot were paralysed. Ulceration appeared early in the heel. Soon after, the nails exfoliated. At the end of three years, Romberg saw the patient again. She rested on the external edge of the right foot, which thus presented the appearance of varus. Further ulceration ensued, with necrosed bone, and desquamation of the epidermis, like psoriasis, the colour of the skin being dark red and shining.§ Hamilton relates a case of Mr. Crampton's, in which puncture of the musculo-cutaneous nerve during the operation of blood-letting, was followed by the most severe neuralgia and other symptoms, and the wounded arm became *covered with hair.*[*] Larrey mentions the case of a soldier who received a kick from a horse over the right eyebrow. The frontal sinus was fractured, and after some days, cutaneous hyperæsthesia and tetanic symptoms of the same side supervened. To Larrey's great surprise, the hair and moustaches of the injured side bristled up and became exquisitely tender to the slightest touch. About a year later the nails became ragged and rough, and fell off.[†] Similar effects were observed by Bellengeri from a contused wound above the supra-orbital foramen. The hair on the injured side not only became stiffer, but grew with much greater rapidity.[‡] Pouteau records a remarkably interesting case, with symptoms similar to those of Larrey and Bellengeri, and resulting from a contused wound of the supra-orbital nerve.[§] In a young lady, who came to me with protracted neuralgia of a circumscribed portion of the scalp, the hair over the painful part was not only coarser and stiffer, but perfectly white. Reading, or playing the piano for a few minutes only, brought on the most insupportable and indescribable feelings, radiating as it were from the affected part. In a case of temporal neuralgia mentioned by Trousseau, the hair on the affected side turned white, and acquired considerable stiffness in a very short time.

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* *Med.-Chir. Trans.* vol. vii. p. 175. † Ibid. vol. iii. p. 90.

‡ *London Hospital Reports*, vol. iii. p. 321.

§ Romberg, *Nervous Diseases of Man*, vol. i. p. 205.

With regard to cutaneous eruptions resulting from injuries of nerves, numerous interesting observations besides the one already quoted from Romberg, have been recorded by Rayer,[||] Earle,[¶] Rouget,[**] Oppolzer,[††] Charcot,[‡‡] Raynaud,[§§] Kuhl,[||||] Thomas,[¶¶] Paget,[***] Brodie,[†††] and others. These cutaneous affections have been shown to consist chiefly of erythema, and of vesicular eruptions allied to eczema, erysipelas, and herpes. Mr. Paget has given an excellent description of the erythema observed in cases of injured nerves. 'In well-marked cases,' he says, 'the fingers which are affected are usually tapering, smooth, hairless, almost void of wrinkles, glossy, pink or ruddy, or blotched as if with permanent chilblains. They are commonly also very painful, especially on motion, and pain often extends from them up the arm.'

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[*] *Dublin Med. Journal,* 1838, vol. xiii. p. 46.
[†] *Clin. chirurg.* tome i. p. 200.
[‡] *Archiv. gén. de Méd.* 1835, tome vii.
[§] *Œuvres posthumes,* tome ii. p. 92. obs. iii.
[||] *Traité des Maladies de la Peau,* 1822, tome ii.
[¶] *Medico-Chirurg. Trans.* vol. vii.
[**] *Journal de Physiologie,* 1859.
[††] *Allgemeine Wiener medicinische Zeitung,* No. 48, Nov. 1866.
[‡‡] *Journal de Physiologie,* 1859.
[§§] *Thèse de Paris,* 1862.
[||||] Apud Samuel, *Die trophischen Nerven,* p. 189.
[¶¶] *Archiv. der Heilkunde,* 1866, p. 153.
[***] *Medical Times and Gazette,* 1864.
[†††] *Works,* vol. iii. 'Local Nervous Affections.'

It is to Drs. Mitchell, Morehouse, and Keen, of the United States, that we owe the most precise account of the different morbid changes in the skin, and other tissues, resulting from particular injuries of nerves.* They have shown that the changes in the skin which follow wounds of nerve-trunks are of two kinds. The first is the result of *entire* division of the nerves of the part, with palsy of the whole limb. In most instances there is early œdema of the part. The skin thickens and dries; the epithelium hangs in patches here and there, and is yellow and even pale-brown. These peculiarities, however, are partly the consequence of mere disuse. But the nails become curved as in tubercular disease.

The second kind of pathological change is the result of only partial division of the nerve. The skin is deep red or mottled, or red and pale in patches. The cuticle seems partially lost, so that the cutis is exposed in places. The sub-cuticular tissues are nearly always shrunken. The surface of all the affected parts is glossy, generally devoid of wrinkles, and perfectly free from hair. Sometimes the fingers are dotted with islets of thin and red and glossy skin. This glossy appearance of the skin is always accompanied by pain, generally of a burning character.† 'No particular time can be named as the period at which these changes in nutrition first show themselves. This alone can be said, that they do not belong to cases of complete destruction of the nerves. They may begin within a few days, or at any later date; but usually they arise while the wound is healing.'

If the nerves of the hand be injured, the hair, after some months, disappears from the affected fingers, and the nails undergo remarkable alterations. These alterations consist of a curve in their long axes, an extreme lateral arching, and sometimes a thickening of the cutis beneath their extremities. In other instances the skin at that end of the nail next the third finger-joint becomes retracted, leaving the sensitive matrix partly exposed. At the same time the upper line of union of skin and nail retracts into or under the latter part, and in place of a smooth edge is seen through the nail as a ragged and notched border. 'No deformity of the nails in tubercle at all approaches that which nerve-wounds occasion. Indeed, we think it would be possible for one familiar with these cases to diagnose the existence of nerve-lesion from the form of these protuberant and oddly-curved nails.' When the nails of the toes have been attacked, the curving is as marked, but a distressing ulceration is apt to occur at their angles, and to break out again and again. The best remedy then is excision of the outer edge of the nail, matrix and all.*

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* *Gunshot Wounds and other Injuries of Nerves.* Philadelphia, 1864.

† Page 80.

In a case mentioned by Mr. Jonathan Hutchinson of division of the ulnar nerve, the nail of the little finger, about two months after the accident came off together with the skin, 'like the end of a glove.' It grew again, but not to more than half its original size.†

(c) *Alteration of secretions after injury of nerves.*—We have already seen that after the nerves of a limb have been completely divided, the skin is generally dry; but injuries of nerves without complete section modify the secretions in regard both to quality and quantity. The secretion is generally abundant, and sometimes intensely acid, so that an odour like vinegar can be smelt in the neighbourhood of the patient. In one instance the odour of the sweat was 'disgustingly heavy,' and resembled the smell from a bad drain.‡

(d) *Periodical swelling of joints, &c.*—This peculiar affection, which is particularly interesting to the surgeon, is the result of both idiopathic neuritis and traumatic affections of nerves. It so closely resembles ordinary rheumatism or gout that it is not easy to point out the distinguishing characters of the two kinds of disease. Remak calls it *arthritis spuria.*§ Dr. Mitchell has recorded some very interesting cases of this affection, in the *American Journal of the Medical Sciences* (1831, vol. viii.). It may occur at any time after the first few days of injury to a nerve, and may attack any articulation, or all the articulations of a member. Once fully established, it keeps the joints stiff and sore for weeks or months. When the acute stage is past, the tissues about the articulations become hard, and partial anchylosis results. Of all the agencies which impede movement, it is the most difficult to relieve.

(e) *Atrophy and contraction of muscles from injury of nerves* has been for many years carefully investigated by Dr. Duchenne

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* Page 82.

† *London Hospital Reports*, vol. iii. p. 308.

‡ Mitchell, Morehouse, and Keen, op. cit. p. 86.

§ *Allg. med. cent. Zeitung*, Berlin, 1863. *Ueber den Einfluss des Nervensystems auf Krankheiten der Knochen und der Gelenken.*

(de Boulogne), whose work (*Électrisation localisée*) contains a number of the most valuable cases. Complete division of a nerve is always followed to a certain extent, in the course of time, by atrophy of all the muscles to which that nerve is distributed; and the wasting is much more rapid when the main artery has been divided or interrupted. But in *partial* division or injury of the nerve, only those muscles are liable to suffer which are supplied by the injured fibres, and in this case the wasting is more rapid and decided than when the nerve has been *completely* divided. Thus, a whole group of muscles may be affected, or only part of a group; a single muscle only, or even only part of a muscle, which, moreover, may be affected in either a lateral or a longitudinal direction. So soon as the muscular fibres begin to suffer in nutrition, their tension or tonicity diminishes, they become softer, more flabby or relaxed. Sooner or later they begin to waste, and after a time, in many instances, they acquire a kind of morbid tension, and contract or shorten permanently to a greater or less extent, causing a variety of deformities, alterations in the form of the joints, and loss of natural movement. This morbid tension, however, is not always in proportion to the degree of atrophy, for in some instances the wasting is slight while the muscular contraction is extreme. Moreover, a muscle may become shortened from paralysis of its opponent, and this condition must be distinguished from the shortening which is due to atrophy.

Early loss of tone in a muscle, from injury of its nerves, is a bad sign. Rapid diminution of size and contraction, when due to nutritive changes, is still worse. All these changes are ominous of ultimate deformities and permanent loss of power.* In the diagnosis and prognosis, no less than in the treatment of injuries to nerves and their consequences, electricity plays a most important part; and for its first application to these purposes, we are chiefly indebted to the remarkable sagacity and skill of Dr. Duchenne (de Boulogne).† The way in which he has made it an instrument of diagnosis and prognosis, in diseases and injuries of nerves, is no less important than beautiful in a practical point of view.

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* Mitchell, Morehouse, and Keen, p. 120.

† The following statement is made by the most competent judges on this subject. 'As respects its value in traumatic lesions of nerves, we feel constrained to state that it has been understood and rightly appreciated by Dr. Duchenne alone. After a year of great experience in the use of electricity, we are still satisfied of the essential correctness of almost every proposition on the subject which this distinguished physician has laid down.' (Mitchell, Morehouse, and Keen, op. cit. p. 136.) I am glad to learn from Dr. Duchenne, that

When a healthy muscle is made to contract by means of electricity, it becomes the seat of a peculiar pain, which is called electro-muscular *sensibility*. This pain, however, is not caused by the contraction, for it is still experienced in muscles which have lost the power of contracting under the influence of electricity. The property of contracting under the same influence, is called electro-muscular *contractility*. Now it has been laid down by Dr. Duchenne as a law which is very remarkable, but which subsequent experience has fully confirmed, that the persistence of this property of electro-muscular contractility is not necessary for the exercise of *voluntary* contraction.* On the other hand, muscles that are partially or completely paralysed, with regard to the *will*, may sometimes retain their normal degree of electro-muscular contractility; while in certain cases, muscles which have lost, to a very unequal degree, the power of contracting under the stimulus of electricity, may seem to be all equally paralysed as regards the *will*. There is another remarkable and important practical point to be remembered, viz. that although the retention of electro-muscular contractility is not necessary for the exercise of voluntary contraction, yet that whenever it is lost, or even impaired, the prognosis is unfavourable in reference to the return of *voluntary* control, and indicates that the affected muscles will suffer in their nutrition and become atrophied. It is curious, however, and very important, that notwithstanding the loss of electro-muscular contractility, the *therapeutical* power of Faradisation may still exercise its influence on the paralysed muscles. If electro-muscular sensibility be retained, the chances of recovery are more favourable; and whenever it is impaired, if pain be excited by the action of electricity, the effect is a favourable sign.

Different forms of paralysis which depend on traumatic affections of nerves, and which may appear to be exactly alike —which cannot, indeed, be distinguished from each other by

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a somewhat abridged English translation of his laborious work is in course of preparation. It ought to be in the hands of every surgeon and physician. No one, judging from its unhappy title alone, would expect to find in it so such a mine of pathological facts.

* *De l'Électrisation localisée*, 2^{me} éd. p. 330.

the ordinary modes of diagnosis—may nevertheless differ essentially from each other with regard to their progress, their gravity, or their termination. The electro-muscular test alone enables us to discriminate those cases in which muscles will remain paralysed and become atrophied in the course of a few months, from other cases in which it may be predicted with certainty that the paralysis, without atrophy of the muscles, will disappear, either spontaneously or by means of Faradisation.

A man under the care of the late eminent surgeon M. Roux, at the Hôtel-Dieu, had dislocation of the humerus forward. The reduction was deferred till the next morning, when it was found that the head of the bone had changed its place to the axilla. The muscles of the arm, fore-arm, and hand were completely paralysed to the will, but sensibility was retained. This state of things having continued for nearly a month, with gradual wasting of the muscles, Dr. Duchenne was requested by M. Roux to examine the arm by means of Faradisation. All the movements of the upper extremity were found to be completely abolished, and it would therefore have been natural to conclude that all its muscles were equally affected, or rather that all the nerve-fibres that supplied them were equally injured. But it was found that some of the muscles had completely lost their electro-muscular contractility, and subsequently wasted rapidly; while the other paralysed muscles, which had not suffered in this way, not only escaped atrophy, but recovered their voluntary power after a few applications of electricity. The deltoid had partially lost its electro-muscular power, and therefore required for its restoration a little longer time than those which wholly retained it.

In paralysis resulting from *cerebral* disease, the electro-muscular contractility remains unaffected, and therefore Faradisation is of great importance in the differential diagnosis of paralysis which follows injuries of nerves or affections of the spinal cord.

A man was admitted into the Hôpital de la Clinique, for paralysis of the right arm. According to his own account, some days before his admission he woke in the morning with his arm paralysed, but perfectly free from pain. At first he only felt formication in the fingers, with a sensation of numbness and coldness in the whole limb; but a few days after, he began to experience a lancinating and intermitting pain of no great intensity in the right cervical region. The suddenness of the attack, without any preceding pain, occurring in a young man who had not suffered from any traumatic lesion of nerves, or been apparently exposed to any other influence that might occasion paralysis of the arm, would reasonably suggest a cerebral cause. But on examining the limb by means of Faradisation, it was found that the majority of the muscles had lost, in a greater or less degree, their property of contracting under the stimulus of electricity—a property which, as already stated, is retained in paralysis resulting from cerebral causes. Judging from these facts, Dr. Duchenne at once came to the conclusion, that the real cause of the paralysis was to be referred to some alteration either of the brachial and cervical plexus or of that portion of the spinal cord from which they derive their origin. On further examination a month after by M. Nélaton, who then for the first time took charge of the patient, he was found to be affected with tertiary symptoms of syphilis. That distinguished surgeon thought that some kind of exostosis might be the cause of the paralysis, and accordingly prescribed the proto-iodide of mercury. After some days the pain ceased, and then the paralysis gradually disappeared from the muscles which had not lost their electro-muscular contractility.

Treatment.—For restoring the paralysed and wasted muscles to their original condition, electricity is unquestionably the most important agent. It should be employed daily for at least ten or fifteen minutes, and each muscle should be separately Faradised. The period when the treatment by electricity should commence must vary according to the peculiarities of the case. If the electro-muscular contractility remain intact, Faradisation should be employed as soon as possible. But when this property is lost—that is, when the nerve-influence is no longer supplied to the muscles, and more particularly when the muscular sensibility is impaired—the treatment by electricity is of no service, and should not be employed until some months after the injury, or until there is good reason to believe that the nerve-lesion is repaired. In addition to electricity, friction and shampooing should be employed, with passive motion, and voluntary exercise of the muscles, as soon as voluntary control is in any degree restored. The douche is often of great service, particularly if hot and cold water be alternately used. Care should be taken to preserve warmth in the affected part. When flexion or extension of a limb occurs in consequence of contracted muscles, splints, bandages, and other apparatus will be necessary.

When the effects of the nerve-lesion are aggravated or prolonged by some peculiar diathesis, or when the health of the patient is suffering from severe pain and want of sleep, general as well as local treatment must be adopted. Narcotics, iron and quinine, cod-liver oil, and phosphorus are the most worthy of recommendation. The hypodermic method is the best mode of administering narcotics. If morphia be employed, the first injection should not exceed the sixth of a grain.

(2.) *Changes due to Idiopathic Affections of Nerves.*

Although traumatic lesions of nerves give rise to the most serious nutritive changes in the tissues to which those nerves are distributed, it is not uncommon to find that idiopathic affections of nerves are followed by changes of a similar nature.

The principal alterations in the nutrition of the skin resulting from idiopathic neuritis and neuralgia are manifested in the form of herpetic eruptions. Rayer, I believe, was the first to point to neuralgia as the cause of these eruptions, while other writers, including even Valleix and Cazenave, regarded the neuralgia as a consequence of the cutaneous affection. Rayer's opinion, however, has been fully confirmed by subsequent observation. The pain is frequently found to precede the eruption, while the latter is sometimes seen to follow the course of the affected nerve.

Barensprung has recorded a very valuable case, to which I have already alluded, and which proves in the most convincing manner, the close relation between idiopathic inflammation of nerves and herpes zoster. The patient was a child one year old. The eruption extended round one side of the thorax from the sixth to the ninth rib, and after death, which resulted from tubercular disease, the roots of the sixth, seventh, and eighth intercostal nerves, but especially the seventh, were increased in size and of a red colour, in consequence of the presence of enlarged and tortuous vessels in the neurilemma. The diameter of the seventh intercostal exceeded by more than one-half that of the fifth or the ninth. The corresponding intervertebral ganglia were firmly adherent to the intervertebral canal; their connective tissue presented an inflammatory redness, and they were decidedly increased in size.*

MM. Charcot and Cotard have related the equally interesting case of a woman, aged seventy-eight, from whom a cancer of the right breast was removed in August 1865. In October of the same year, she complained of sharp pains in the right shoulder, and in the right half of the neck. These pains were continuous, but increased in the severity at intervals, during which the patient appeared to suffer the most acute pain. About December 15 of the same year an herpetic eruption made its appearance over the whole right half of the neck, limited exactly, both before and behind, to the median line. The eruption occupied all the other parts of the skin which are supplied by branches of the cervical plexus on the right side, but was not followed by any diminution of pain. The patient died on December 26, after symptoms of effusion into the pleura on both sides. On post-mortem examination it was found that while both the anterior and posterior roots of the spinal nerves in the cervical region were perfectly healthy, the intervertebral ganglia, as well as the compound tracks formed by the union of the two roots, presented a slight tumefaction, and a vascularity which was manifested by a bright red colour. The difference was striking when the corresponding parts on both sides were examined.†

Among the most remarkable cases of neuritis giving rise to herpetic eruptions of the skin, are those which M. Leudet, of the Hôtel-Dieu of Rouen, has shown to be caused by the inhalation of carbonic acid.

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* Barensprung, *Annal. Charitekrank. zu Berlin*, vol. xi. part ii. p. 96.

† *Mémoires de la Société de Biologie*, 1866, p. 41. From such observations as these, Barensprung seems to be quite satisfied that the intervertebral ganglia on the posterior spinal roots, give origin to the so-called trophic nerves; but it appears to me that facts do not warrant the conclusions at which he arrives.

When the symptoms of asphyxia have subsided, it is not uncommon, after a variable number of days, to find certain disorders both of sensibility and motion. The lower extremities are the parts which are usually affected, although different parts of the nervous system are sometimes involved. In one case, which proved fatal, M. Leudet found the right sciatic nerve at least one-third thicker than the left; its neurilemma was injected, thicker, and more indurated than on the opposite side.

In these singular cases, the skin was affected by eruptions similar to herpes. These eruptions appeared almost immediately after the subsidence of the symptoms of asphyxia, and in general, lasted only a short time.[*]

Herpes is not the only cutaneous eruption that has been found to follow neuralgia and neuritis, whether traumatic or idiopathic: lichen has been observed by Canuet in cases of neuralgia;[†] acne and erysipelas have been seen by Hasse[‡] and Romberg[§] to accompany the same affection.

J. LOCKHART CLARKE, M.D.

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[*] *Recherches sur les troubles des Nerfs périphériques, et surtout des Vasomoteurs, consécutifs à l'asphyxie par la vapeur de charbon. Archiv. de Médecine*, mai 1865.

[†] *Thèse de Paris*, 1855, p. 29.

[‡] *Nervenkrankheiten*, p. 62.

[§] Op. cit.

DISEASES AND INJURIES OF NERVES.

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PART II.

REMOTER CONSEQUENCES OF NERVE-LESIONS.

Introduction.

TWO distinct groups or classes of symptoms may be caused by a lesion of a nerve: in one class the symptoms are the effects of the *loss of function* or *cessation of action* of the nerve; in the other, on the contrary, they are produced by *an action* of the injured or irritated nerve. In the first class, therefore, the symptoms depend on *lack of action,* while in the second, they are due just to the reverse, i.e. *existence of action,* in a nerve.

Each of these two classes of symptoms may be subdivided. As there are at least four different kinds of nerves, four distinct kinds of symptoms of loss of function or cessation of action may be observed after a lesion of a nerve:

1st. There may be paralysis of motion.

2nd. There may be paralysis of centripetal nerves (sensitive, incito-motory, &c.).

3rd. There may be paralysis of the vaso-motor nerve-fibres, in consequence of which the blood-vessels may be distended and full of blood.

4th. There may be paralysis of the special nerve-fibres, the normal influence of which consists in giving activity to nutrition and secretion.

Leaving aside these four kinds of symptoms, I will confine myself here to the study of some of the effects of irritation of nerves. These effects may be grouped under two heads, —the *peripheric,* or *direct;* and the *remote, indirect,* or *reflex.* Of the peripheric, or direct effects, I will simply say that they give origin to five kinds of symptoms:

1st. Contraction of muscles.

2nd. Referred or subjective sensations (formication, pricking, feelings of pain, heat, cold, &c.).

3rd. Diminution in the quantity of blood, owing to the contraction of blood-vessels in the part where the injured nerve distributes its fibres.

4th. An increase in the quantity of blood when the irritated nerve-fibres are those having normally the power of increasing the interchange between the blood and the tissues.

5th. In consequence of one or the other, or a combination of the just-mentioned kinds of changes in the circulation of blood, there are various alterations of nutrition or secretion in the eyes, the skin, the joints, &c.

Of these five kinds of effects of irritation of nerves, four, viz. the first, third, fourth, and fifth, may also be caused either by a genuine reflex action, or by some peculiar influence upon or through the nervous centres. I propose here to treat only of these four last kinds of symptoms.

All the functional affections or disorders, and most of the organic diseases are frequently produced by an influence exerted upon the nervous centres by an irritation of any part of the length of a nerve. This irritation may occur in the ramifications of a nerve in a mucous membrane or the skin (and be due to worms, a calculus, &c., or to cold); or it may depend on an organic or a functional affection of the trunk of a nerve (as in cases of wounds, burns, tumours, or neuralgia). In most instances an inflammation of the various viscera owes its origin to a reflex influence on the organ which becomes inflamed, proceeding from the irritation of some cutaneous nerve-fibres by a draught of cold air. I will not say more here on this reflex origin of visceral inflammation caused by cold acting on the skin, my object being only to give an outline of the various effects of injuries or diseases of all parts of nerves excepting the network of their terminal ramifications.

Of the various reflex and other remote effects of irritation of centripetal nerves, the following are the principal, of which I propose to speak successively: *epilepsy*, *tetanus*, *hysteria*, *catalepsy*, *chorea* and other *convulsive affections*, *trembling palsy*, *paralysis* of various kinds (*local paralysis*, *hemiplegia*, &c.), *anæsthesia*, *amaurosis*, *deafness*, *collapse*, *insanity*, *delirium*, *aphasia*, *coma*, *neuralgia* and other *painful affections*, *inflammation*, *atrophy*, *hypertrophy*, and other *morbid alterations of* *nutrition and secretion.* After having mentioned clear and positive facts, showing that all these affections may be caused by an injury to, or a disease of, a nerve, I will briefly give the rules concerning the diagnosis and treatment of these effects of injuries and diseases of nerves. This essay will therefore consist of two sections: the first, relating to facts demonstrating the existence of a great variety of reflex and other remote effects of irritation of centripetal nerves; the second, giving the principal features and rules of diagnosis and treatment of these effects of diseases and injuries of branches and trunks of nerves.

SECTION I.—AFFECTIONS OF THE NERVOUS CENTRES AND OTHER ORGANS, CAUSED BY AN INJURY TO, OR A DISEASE OF, A NERVE.

Epilepsy.—Of all the nervous and other complaints that may be due to an irritation starting from the trunk, branches, or ultimate ramifications of nerves, very few, if any, are more frequent than epilepsy. Diseases of all the mucous membranes, or their irritation by worms, diseases of the cerebral or spinal meninges, dentition, &c., are known to be frequent causes of this convulsive affection. But it is not so well known, that an injury to, or a disease of, a nerve, not rarely produces epilepsy. Indeed, even a man of great authority as regards epilepsy, Dr. Herpin,* has lately maintained that in cases in which this affection seemed to have been caused by an external injury, it was, in reality, due to a disease of the nervous centres. It is most important that medical practitioners should not be misled by such an opinion. The rational treatment of that form of epilepsy which appears after a wound, or an organic affection, of a nerve, would certainly be neglected if such a view were admitted. It is, therefore, necessary to demonstrate that in a number of cases an epileptiform affection and also the most genuine epilepsy have been caused by a lesion of a nerve. This demonstration is given by the following kinds of proof:—

1st. In a great many cases, epilepsy has appeared in persons in whom there was no other cause for its production but a wound, a burn, a tumour, an inflammation, or a neuralgia.

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* *Des accès incomplets d'épilepsie*, par Th. Herpin, p. 36. Paris, 1867.

2nd. In a number of the above cases a peculiar sensation, generally miscalled aura epileptica, arose from the seat of the irritated nerve before all or most fits.

3rd. In many of the same cases, the application of a ligature round a limb above the seat of the irritation often prevented the occurrence of fits.

4th. In some of the same cases a pressure on the seat of the external irritation invariably brought on a fit.

5th. In many cases of epilepsy apparently due to an irritation of a nerve, the section of that nerve above the seat of irritation, or the amputation of the limb; the extirpation of a tumour, of a cicatrix, of a decayed tooth, of a carious bone, &c., have cured the patients.

6th. I have discovered, in certain animals, that the irritation of the sciatic nerve by a broken bone, or by some other causes (crushing, tying, or cutting), invariably produces a temporary or persistent epilepsy. This convulsive affection never disappears without treatment, unless the irritation has ceased in the sciatic nerve.

These various facts clearly prove that epilepsy may be due to an irritation of a nerve, and exist without any serious organic change in the nervous centres. For the details of cases like those I have mentioned I will refer the reader to the new edition of my work on epilepsy, which will soon be published. I will only say here, that some of these cases have been observed by perfectly reliable men, such as Sir Astley Cooper, Sir Benjamin Brodie, Dieffenbach, Baron Larrey, &c. I will give one of those cases as a good specimen of reflected epilepsy. It was put on record by Dr. W. Laing of Aberdeen.

M. D., aged twenty-one, had the left hand lacerated by machinery. She went on well till the night of March 6, when she was seized with convulsions, and after a day or two, with trismus and other tetanic symptoms. On April 7 she was dismissed, *cured*; but on June 24 she returned to the hospital. About a fortnight before her readmission she suddenly fell down in an epileptic fit; and since, the attacks have become more and more frequent, recurring five or six times a day, and lasting about five minutes, after which she remained a considerable time in a state of stupor. On the 25th the fits were so severe that she was put in the strait-waistcoat. When the fits were slight, they were confined chiefly to the injured arm. On touching the fingers smartly, the arm was convulsively withdrawn; and when this was done while she was lying in a state of stupor, violent convulsions of the arm were produced. The patient often felt a sensation arising from the injured hand, previous to her fits. As the remainder of the hand was of little use, the fore-arm was amputated: the patient never had the slightest appearance of epilepsy after the operation, and was dismissed cured, a month afterwards. The digital branches of the median nerve, and a branch of the ulnar, were found enlarged to four or five times their usual size, and their extremities bulbous, and firmly embedded in a hard cicatrix.[*]

Tetanus.—Referring to the article on TETANUS in the first volume of this work, I will only say a few words on the important questions relating to the nature and to the local treatment of this affection.

I am really surprised that some persons still doubt that it is owing to a peculiar influence exerted, on the circulation of the blood and the nutrition of the spinal cord and the medulla oblongata, by the irritation of a centripetal nerve, that tetanus arises from a traumatic lesion. I hope that the following facts and reasoning will show that this convulsive affection is truly dependent upon an irritation arising from the injured nerves, and not—as Dr. B. W. Richardson, Roser, Billroth, and others are inclined to admit—from toxæmia.

The relation between the wound and tetanus seems to be positively established—at least, in those cases in which the muscles attacked with spasms are on the side injured. Lepelletier, Sir Gilbert Blane, Swan, Dupuytren, and Mr. Curling,[†] who cites the preceding authors, have seen such cases. My friend Dr. G. H. B. Macleod [‡] relates two cases of fatal tetanus, in which the tetanic spasms were almost entirely limited to the side injured. Baron Larrey states that when the wound causing tetanus is in the anterior part of the trunk, emprosthotonos is the form generally observed.

Other strong arguments in favour of the view that traumatic tetanus is caused by a peripheric irritation, are: 1st, that very frequently the muscles in the neighbourhood of the wound are either the first attacked or the most affected with spasms; 2nd, that in many cases it has been observed by myself and others, that even a slight pressure on the wound or the cicatrix has increased the spasms or produced them, in periods of relaxation (after chloroformic anæsthesia, for instance).

It may seem strange that tetanus will sometimes follow even the slightest wound, and that it will come at any period of inflammation or cicatrisation, and even when there is no pain at all in the wound or its neighbourhood. But this last fact is no objection to the view that tetanus takes place in consequence of an irritation starting from these parts, as we know that all the morbid or normal influences on circulation and nutrition in the nervous centres, may proceed from the periphery, without any pain, or even without the least perceived sensation.

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[*] Aberdeen Infirmary Reports, in *Lond. Med. Gazette* for Dec. 25, 1840.

[†] *A Treatise on Tetanus*, pp. 87, 174. London, 1836.

[‡] See his excellent work, *Notes on the Surgery of the War in the Crimea*, pp. 155-161. 1858.

The kind of lesion which most frequently produces tetanus, implies that there is a great irritation of nerves, although there may be no marked pain. In a table given by Mr. Poland in this work (vol. i. p. 317), we find that out of 1,364 cases of major and minor operations at Guy's Hospital, there was but one case of tetanus; while out of 398 cases of compound fractures and 594 cases of wounds of all varieties, there were 18 cases of tetanus; giving a proportion, when the nerves were simply divided by a sharp knife, of one case of tetanus out of 1,364 patients; and of one case out of 55 patients, after wounds and fractures, when the nerves were bruised or much irritated. In a statistical table given by Dr. Friederich,* the influence of great irritation of nerves in causing tetanus is also demonstrated: out of 176 cases of that affection, only 11 occurred after amputation, and 33 after gunshot wounds, while 61 were due to contusion or comminutive fracture, and 71 to wounds by puncturing instruments, or dilaceration and bruising of tissues by nails, pieces of wood, &c. Dr. Lawrie's statistics agree with those of Friederich.†

The cases of cure of tetanus either by an amputation of a limb or by section of a nerve, clearly prove the dependence of this affection on an irritation starting from some peripherical part of a nerve. The same conclusion flows out from numerous facts like the following, to which I might add many others. Tetanus is pointed out to have been caused by a small splinter of bone sticking in the radial nerve (Hennen), by a portion of a whip embedded in the cubital nerve (Dupuytren), by an application of caustic potash on the coraco-brachial nerve (Frere), by shot corns in the tibial nerve (J. Hutchinson), by a splinter of wood in the radial nerve (Morgan), by neuritis (Curling, Lepelletier, Froriep, and others), by ligatures on nerves of limbs (Larrey, Béclard, Portal, &c.), by a small piece of broken bone passing through the peroneal nerve (Wutzer and O. Weber), by the crushing of the anterior tibial nerve, between fragments of broken bone (Alquié), and by partial division or tearing of nerves (Swan, Liston, Billroth, &c.). In cases in which the spinal cord was either inflamed or rendered extremely excitable, the section of a nerve or an amputation has been of no avail; and in some cases, also, in which an inflammation had been propagated high up in the trunk of a nerve, towards its roots, these operations have been useless; but such failures might have been avoided had these modes of treatment been applied earlier, and had all the nerves been divided higher up than they have been. I need not say that the simple division of a nerve should always be preferred to an amputation, unless there are some special reasons for this last operation.

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* *De Tetano traumatico*, Berolini, 1837.

† *The Glasgow Medical Journal* for Oct. 1853; and *The Association Medical Journal*, Nov. 18, 1853, p. 1017.

Hysteria.—The extreme frequency of this affection in women renders it difficult to prove that it may be due to an irritation of a nerve. However, there are cases in which it seems quite clear that hysteria was really caused by a wound, or the irritation of a tumour.*

Two very interesting cases are reported by Dr. Parsons; † one observed by himself, the other by Dr. S. P. Hildreth.

Morgagni mentions the case of a young girl, who, after a wound to a finger by the biting of a sparrow, was attacked with fits of trembling and screaming, recurring sixteen or eighteen times a day.‡

Raynaud relates the case of a woman, who, after having received a blow on the breast, had a first attack of hysteria. Two small tumours soon appeared at the injured place, and for seven years hysterical attacks occurred several times every day. These tumours were removed by Boyer, and immediately after the operation the attacks ceased, and did not recur again.§

Three years ago, in a patient of mine of a highly nervous temperament, but who never had had any marked symptoms of hysteria, convulsions and delirium, with some degree of lock-jaw, frequently appeared and ceased, during three or four days, after a slight wound by a needle in front of the knee-joint, just below the patella. The needle broke at the time of the accident, and a small part of it remained under the skin. As soon as the pain ceased in the little wound, after the extraction of the point of the needle, the patient got well, and has had no return of hysterical symptoms since.

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* An interesting case, published by Hamilton (*Dublin Journal*, 1838, vol. xiii. p. 42), shows how careful we must be as regards the signification of symptoms in hysterical patients. All the most characteristic features of neuritis existed in a patient after a wound, but they disappeared *at once* after a violent fit of hysteria.

† *American Journal of the Med. Sciences*, April 1851, pp. 307, 312.

‡ *De Sedibus et Causis Morborum*, Lutetiæ, 1822, vol. vi. p. 613, epist. liv. § 45.

§ Raynaud, in *Archives de Médecine*, 1829, vol. iii. p. 434.

Brachet has seen a temporal neuralgia produce hysterical fits every time it appeared, and for all the time it lasted.*

Sir Benjamin Brodie mentions several cases in which a wound was the cause of hysteria.†

A very curious case of hysteria in a man, cured by the removal of a tumour of the external ear, has been published by Dr. Bastien, in his inaugural dissertation.‡

In hysteria as in epilepsy, an aura starting from some point of the periphery of the body may precede an attack, and also the aura may be created by a pressure on some part. In those cases the same means of treatment as in epilepsy may prove useful. These facts, and the cases I have briefly mentioned, show that hysteria, like epilepsy and tetanus, may be caused by an irritation of a nerve. I must say, however, that a persistent cure of hysteria is very rarely obtained. Various operations, such as extirpations of cicatrices, amputations, &c., to cure hysterical spasms due to an irritation of nerves, have proved beneficial only for a time, in several cases of Sir Benjamin Brodie, § of Mr. Hancock, Tyrrel, and Bransby Cooper. ||

Catalepsy.—I have seen a case of this affection in which attacks were brought on at once by even a slight pressure on tender spots between the shoulders. Catalepsy, therefore may, like other neuroses, be produced by a peripheric irritation.¶

Chorea.—St. Vitus's dance may be caused by an injury to a nerve.

In a case of Dr. Borelli, of Turin, chorea was caused by a neuroma of the foot, in a child thirteen years old. This convulsive affection was at once lessened, and in four days cured, after the extirpation of the neuroma.** Andral mentions a case of chorea caused by the irritation of a finger by a retroverted nail.†† Dr. J. Malden has cured a woman of choreic movements by the extraction of a decayed tooth.‡‡

Hydrophobia.—I will try to show elsewhere that the symptoms

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* *Traité de l'Hystérie*, 1847, p. 253.

† *Lectures illustrative of certain Local Nervous Affections*, 1837, pp. 40–46.

‡ *Thèse inaugurale*, soutenue le 20 novembre, 1855. Paris.

§ Loc. cit. p. 83.

|| *Lancet*, March 20, 1852, pp. 281-283.

¶ Hufeland relates a case of attacks of *running* and of *catalepsy*, caused by a blow on the head, and cured by trepanation (cited by Roth, *Musculation irrésistible*, p. 32).

** *Gazette des Hôpitaux*, 1850, p. 454.

†† *Cours de Pathologie interne*, vol. iii. p. 304.

‡‡ *Archives de Médecine*, mars 1855, p. 338; from *Trans. Provincial Associat.* vol. xix.

of this terrible affection depend on a local effect of the virus on the wounded nerves, and that some chance of cure might be obtained by division of the irritated nerves. Already in the last century, G. Hicks proposed this means of treatment against hydrophobia.* I owe to Dr. Stokes of Dublin, the mention of a most important case, showing that there is good ground to hope that hydrophobia might sometimes be cured by amputation or division of a nerve.†

Tremulous movements.—The so-called *trembling palsy*, which so often consists simply in involuntary tremulous movements, without any palsy, may be caused by an irritation starting from a nerve.

Sabatier ‡ relates the case of a young man, who, after a wound of the saphænous nerve, near the knee, was attacked with violent trembling of the leg and thigh, which lasted many months. In a patient sent to me by Mr. Erichsen, an injury to a nerve of the left arm has produced trembling in both arms. In another patient, for whom I was consulted by Mr. M. H. Collis of Dublin, shaking palsy began in a fractured limb, and thence extended to the other limbs. Several cases are on record showing that the shaking due to an external injury may become general. §

Rotatory convulsions.—I have found that an injury to the auditory nerve in animals is at once followed by rotatory movements. I do not know of any case of wound of that nerve in man having produced the same symptoms; but several cases are on record in which these movements have been observed in man when the auditory nerve was irritated by an inflammation or some other cause (an injection of caustic, &c.).

I would refer for these cases to my work on the *Central Nervous System*, p. 195, only adding here, that since that publication I have seen three cases of that peculiar kind of involuntary movements, caused by an affection of the internal ear. An irritation of other nerves may produce the same effect. Dr. Krieg relates the case of a patient wounded on the forehead, and on whom a touch of the injured skin produced attacks of exceedingly rapid rotatory movements. ||

Local convulsions.—It is well known that wounds of the branches of the fifth pair of nerves may by a reflex influence pro-

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* *Lond. Med. and Phys. Journal*, vol. xvii. p. 277.

† The case above mentioned, and the reasons I have for the hope I have expressed, will be found in the Appendix to my work, *Lectures on the Physiol. and Pathol. of the Central Nervous System*, p. 261 et seq. 1860.

‡ *Médecine opératoire*, vol. i. p. 254.

§ *Inquiry concerning Constitutional Irritation*, by B. Travers, p. 115, 1826; and *Treatise on Diseases and Injuries of Nerves*, by J. Swan, p. 124, 1834.

|| *Histoire de la Musculation irrésistible*, par le Dr. Roth, p. 78. Paris, 1805.

duce spasms of the muscles of the eyes, or trismus, or histrionic convulsions. It is known also that muscles of the limbs and trunk may be seized with either tonic or clonic reflected convulsions from an irritation of a nerve. Sneezing, hiccup, cough, and vomiting are sometimes also caused by the reflex influence of wounds. Spasms of the sphincters (*vesicæ et ani*), of the œsophagus, the larynx, &c., are also among the reflected phenomena not rarely caused by an irritation of superficial nerves.

Contracture of blood-vessels.—Many experiments establish that blood-vessels will contract by a reflex action.* In hysteria and other nervous affections a reflex vascular contracture frequently occurs.

An eminent American clergyman has given me the details of a most remarkable case of prolonged reflex contracture of blood-vessels, he himself being the patient. After having violently struck his leg (two inches above the knee) against a piece of paling-fence, he was soon apparently cured of the local injury; but an influence upon the blood-vessels of the limb showed itself; so that for a whole winter it remained extremely cold, and ever since, for twenty years, its temperature has been lower than that of the other leg. Swan † has also observed a case of permanent reflex contracture of blood-vessels. I will revert to this subject in speaking of reflex muscular atrophy.

Paralysis.—I will not enter here into the discussion of the great question of the mode of production of paralysis when caused by an irritation of a nerve. I will only say that there are two absolutely different kinds of paralysis produced by such an irritation: in one kind a congestion or even an inflammation takes place in a part of the nervous centres by an influence exerted by the peripheric irritation, and the paralysis then produced is accompanied by the usual symptoms of congestion or inflammation of some part of the brain or spinal cord; while in another kind the paralysis exists without any symptom of congestion or inflammation of the nervous centres. This second kind of paralysis caused by an irritation of a nerve is most likely due, at least in some cases, to a reflex contracture of blood-vessels ‡

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* See my researches on this subject, with my friend's Dr. Tholozan (*Journal de la Physiol. de l'Homme*, etc. 1858, p. 497); and Dr. J. S. Lombard (*Archives de Physiol. norm. et pathol.* 1868, p. 688).

† Loc. cit. p. 157.

‡ An able physician, trying to ascertain the correctness of a statement of mine, that an irritation of nerves of the kidney may, by a reflex action, produce a contraction of blood-vessels of the pia mater of the spinal cord, has been unable to succeed, owing to the fact that after having laid bare that

Anæsthesia.—A reflex anæsthesia is not rare in cases of neuralgia.

Many cases of reflected anæsthesia from a wound and other injuries of nerves are on record. A remarkable case of Baron Larrey (loc. cit. vol. v. p. 35, 1821), and an important one of Roche (quoted in my *Lect. on the Centr. Nerv. Syst.* p. 131), particularly deserve to be mentioned. I have observed anæsthesia of the arms in an able lawyer of London, which was caused by a blow on the back of one knee. Several interesting cases have been published by Drs. S. W. Mitchell, Morehouse, and Keen. In one case a shell-wound of the left thigh produced anæsthesia of the right thigh.* I have several times seen anæsthesia of the whole of one side of the face, in cases of neuralgia of one part of the trigeminal nerve on the same side. I have seen also a case of anæsthesia of a part of the forehead and face, in consequence of the irritation of a branch of the fifth pair, on the cheek-bone, by a bruise. In those cases the anæsthesia subsided when its cause was cured.

Amaurosis.—The cases of amaurosis due to an irritation of the trigeminal nerve are frequent enough for my dispensing with quotations of cases. In the first edition of this work I had quoted cases of Wardrop,† Notta,‡ Dr. Noyes of New York,§ and Mr. J. Hutchinson.‖ This last observer has since published several able papers on this subject. I have myself seen five or six cases of amaurosis evidently due to an irritation of the infra- or supra-orbitalis nerve. Cases of amaurosis due to an injury of a nerve of the trunk or limbs are not frequent. Dr. J. B. Colhoun has reported a remarkable case of sudden and almost complete amaurosis of both eyes, caused by a gun-shot wound of the scapula.¶

Deafness.—A neuralgia of the face sometimes produces loss of hearing; other kinds of irritation of branches of the fifth pair may also cause deafness. Dentition and decayed teeth have been pointed out as having had the same effects. Pearson relates a case of wound of the thigh in which deafness was among the symptoms produced (*Medical Facts*, vol vi. p. 109).

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* See an excellent paper by Dr. S. Weir Mitchell, on 'Paralysis from Peripheral Origin,' reprinted from the *New York Medical Journal*, 1866, p. 59. I have lately found that the irritation of the sciatic nerve in the lower animals, produces a slight anæsthesia of the lower limb on the opposite side, and of the face and neck on the side of the irritation.

† *Med.-Chir. Trans.* vol. xii.

‡ *Archives gén. de Med.-Chir.* etc., juillet 1854, pp. 12–21.

§ *American Med. Times*, March 15, 1862.

‖ *Med. Times and Gazette*, May 7, 1859.

¶ *The Medical Examiner*, p. 806, vol. ii. Philadelphia, 1839.

Collapse.—I only wish to say here, that my experiments on several species of animals, compared with facts observed in man, show that there are, at least, three different kinds of collapse :—the first, one in which a reflex arrest or diminution of the heart's action predominates ; the second especially characterised by a great diminution of breathing, produced by a peculiar inhibitory influence on the central organs of respiration, the heart continuing to beat with more or less vigour ; the third, which I have recently described in my lectures at the Faculty of Medicine of Paris, consisting in a powerful influence exerted by a peripheric irritation on the nervous centres of the nerves able to act on circulation, secretion, and nutrition, and, through that influence, producing a cessation of some of the ordinary interchanges between the blood and the tissues. Two opposite conditions of the blood-vessels may exist in this third form of collapse ; these contractile tubes may be dilated or contracted. But in one or the other of these conditions, the blood, instead of being black, in the veins, is reddish and sometimes arterial-looking, and the production of heat ceases in the capillaries. This third form of collapse, consisting, as I have said, in a cessation of the ordinary chemical interchanges between the tissues and the blood, is the most prominent in a large number of cases, and it is also the most dangerous of the kinds of shock or collapse.*

Loss of smell, taste, and hearing.—The celebrated experiment of Magendie, showing that a section of the trigeminal nerve may cause a loss of the five senses in the head, is, most likely, to be explained by a reflex influence. At any rate, an important case of Dr. Blondlot shows that an irritation of the infraorbitalis nerve (wounded) may produce, by a reflex action, loss of hearing, taste and smell.†

Neuralgia.—The frequency of *tic douloureux*, caused by an irritation of a small part of the dental nerves, is such, that it is certainly useless to mention cases. But tic douloureux may be caused by irritations of other nerves, while also an irritation of the nerves of the jaw may cause a neuralgia elsewhere than in the face. Mr. Harvey has seen a case of tic douloureux caused by a tumour of the head. It was ascertained several times, that inflammation of the brain mentioned by Dr. Rowland, I might add several others, among which the most significant have been recorded by Hennen,[*] R. Bright,[†] and Champsaur.[‡] The well-known fact that sometimes, in traumatic tetanus, the spinal cord becomes inflamed, shows that a peripheric irritation may produce inflammation in that organ.

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* See my article on Syncope in *Archives de Physiol. normale et pathol.*, 1869, p. 767.

† *Gazette médicale de Paris*, 1834, p. 44.

Inflammation of the testicle is also sometimes produced by a reflex action from an irritated nerve, as in cases by Sir Benjamin Brodie,[§] Barras,[||] Marrotte,[¶] and others. Sir Astley Cooper[**] says that by irritation morbid actions are excited in distant organs, and adds: 'thus inflammation is produced in the testicle from irritation in the urethra.'

Inflammation of the abdominal or thoracic viscera may also be produced by a reflex action. Proofs of this assertion are abundantly furnished in Lecture X. of my work *On the Central Nervous System.* A reflex inflammation may be brought on to such a degree as to cause an ulcer, which nothing can heal until the cause (viz. the irritation of a nerve) is removed. Sir Astley Cooper mentions several cases of that kind.[††]

As well shown by Mr. J. Hamilton, there is sometimes in cases of wounds of nerves, a deceptive appearance of inflammation with suppuration.[‡‡]

Coma.—This most dangerous morbid state may also be caused by a peripheric nervous irritation.

In a case of Hirsch, quoted by Dieffenbach,[§§] convulsions and coma accompanied local neuralgia, caused by venesection. The patient was cured by two deep incisions over the wound. An immediate cure of coma and convulsions was also obtained in a case similar to the preceding, observed by Dr. Wilson.[||||] Another case somewhat similar, has been recorded by Mr. G. Bell.[¶¶]

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[*] *Military Surgery*, p. 191.

[†] *Reports of Medical Cases*, vol. ii. pt. i. p. 52.

[‡] *Thèse inaugurale*, p. 22. Paris, 1860.

[§] *Lectures on Local Nervous Diseases*, p. 16. 1837.

[||] Cited by Notta, in *Archiv. de Méd.* etc., p. 547, sept. 1854.

[¶] *L'Union médicale*, p. 155, 1851.

[**] *Lectures on the Principles and Practice of Surgery*, by F. Tyrrell, vol. i. p. 4. 1824.

[††] Loc. cit. pp. 7, 8.

[‡‡] *Dublin Journal of the Medical Sciences*, vol. xiii. pp. 50, 55. 1838.

[§§] *British and Foreign Medical Review*, p. 332, vol. xxi. 1846.

[||||] *A Treatise on Diseases and Injuries of the Nerves*, by J. Swan, p. 117. 1834.

[¶¶] J. Swan, loc. cit. p. 119.

Apoplexy.—Even apoplexy can be caused by a peripheric irritation.

A remarkable case of wound having caused neuralgia and apoplectic attacks has been observed by Dr. Maupin.[*] Other cases are mentioned in my old journal.[†]

Muscular atrophy.—I have seen a number of cases of atrophy of muscles produced by a reflex influence from an irritated nerve.

In one case *all the muscles of the thumb* wasted very rapidly after a deep wound of the ulnar side of the fore-arm having divided the ulnar nerve. This cannot be explained by the fact that that nerve sends a branch to two muscles of the thumb, as not only these two muscles, but others, and especially the abductor and the opponens, were notably atrophied.

A neuralgia very often produces atrophy in neighbouring muscles. My friend and pupil, Dr. Cl. Bonnefin,[‡] has seen nineteen cases of muscular atrophy caused by a neuralgia. A remarkable fact, observed in those cases, serves to explain how the atrophy was produced—there was a marked diminution of temperature, most likely due to a spasm of blood-vessels. The amount of blood was consequently diminished, and the wasting occurred owing to the lack of nutritive fluid. Some of the cases of wasting palsy related in Dr. Roberts' excellent work,[§] very likely belong to the class of reflex atrophy.

In a case recorded by Vallez, a wound of the infra-orbital nerve produced a reflex atrophy and paralysis of the face on the same side.[‖]

Atrophy of the cellular tissue.—In some of the cases of atrophy of one side of the face, which Schott and Romberg have called facial trophoneurose, there was an irritation of some sensitive nerve, probably acting by a reflex influence. I saw a case of that rare affection, three years ago in Boston (United States); its probable cause was an irritation of the dental nerves, which produced convulsions in one side of the face (the side where the atrophy was afterwards observed). I will refer for arguments leading to the conclusion that the cellular tissue is alone atrophied in that affection, to a remarkable essay by Dr. L. Lande.[*]

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[*] Quoted by Marchal de Calvi, in *Annales de Chirurgie*, vol. x. obs. 7, p. 73.

[†] *Journal de la Physiologie de l'Homme*, etc., vol. v. 1862, pp. 619, 621.

[‡] *De l'Atrophie musculaire consécutive aux Névralgies.* Paris, 1860. A long list of authors having spoken of muscular atrophy caused by sciatica, is given by Dr. Lagrelette, in his exhaustive work on that kind of neuralgia, entitled *Étude histor. séméiolog. et thérapeut. de la Sciatique*, pp. 34–35. Paris, 1869. See also Notta's paper in *Archives de Médecine*, sept. 1854, p. 557.

[§] *An Essay on Wasting Palsy.* London, 1858.

[‖] *Gazette médicale de Paris*, p. 687. 1847.

Hypertrophy.—Notta mentions cases of hypertrophy of the face and tongue caused by neuralgia.[†] I have seen a case of considerable hypertrophy of the bones and of the cellular tissue, in the face, which occurred after repeated attacks of neuralgia, in a lady whose general health was excellent.

Various kinds of alterations of nutrition and secretion.—The number of facts that might come under this head has considerably increased since the time that my friend Mr. James Paget[‡] first showed how great may be the direct and the reflex influences of the nervous system in disturbing nutrition. *Eruptions* of various kinds (*erythema, pemphigus, urticaria, acne,* and especially the different forms of *herpes*) are often produced by a reflex influence from an irritated nerve, as proved by facts observed by Rayer, G. Simon, Delioux, Notta, Romberg, Hasse, Parrot, and more recently by Charcot, Bärensprung, J. Hutchinson, H. F. Damon, Purdon, and others. I have seen several cases proving clearly the production of certain eruptions by a reflex action. Sir Astley Cooper relates a curious case of *fungoid granulations protruding through an ulcer* in the cheek of a lady, who was quickly cured after the extraction of a tooth.[§] In a case of *ulcerations* and wasting, probably due to neuralgia, Dr. Hooker cured the patient by dividing the popliteal nerve.[||] An *erysipelatous redness* and swelling has been seen by Sherwin in a case of wound of a nerve, and a *swelling* of the foot and leg has been observed by Dr. Watson of New York, in a case of cut of the sole of the foot by a piece of glass.[¶] *Œdema* is a frequent reflex effect of neuralgia. Hamilton has seen two cases of that serous effusion after injuries of nerves.[**] Those persons who know that even *gangrene* may be caused by an influence of the nervous system, as rendered so probable by Dr. M. Raynaud,[††] will not be reluctant to admit that it may be the result of a reflex influence from irritated nerves. Most likely it was not to embolism or to thrombosis, but also to a reflected nervous influence, that gangrene was due in three cases related by Sir William Fergusson,[*] Dr. Gubler,[†] and Dr. Grainger Stewart.[‡] The case of Dr. Stewart is especially worthy of attention. *Altered secretions* are very often due to a reflex influence in cases of neuralgia, and sometimes in cases of wounds of nerves. *Diabetes* is most likely produced by a reflex influence when it comes after a peripheric injury. It may be objected, however, that concussion of the brain is then its constant cause. I have not room enough to discuss the question here, but I think that the possibility of a reflex origin to mellituria is clearly established by cases like those reported by Dr. W. R. Hill, in which a burn was the cause of the secretion of sugar.[§] Cases of alteration of hair due to neuralgia or injuries of nerves are not rare, and I could easily mention many, showing changes in colour, in thickness, in abundance, and in rapidity of growth of hair.[‖] *Cataract and glaucoma* have been pointed out also as evidently resulting, in some cases, from an irritation of nerves.[¶]

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[*] *Essai sur l'Aplasie lamineuse progressive.* Paris, 1869.

[†] *Archives de Médecine*, juillet 1854, pp. 311–12.

[‡] *Lectures on Surgical Pathology*, edit. of 1853, vol. i. p. 44.

[§] *The Lancet*, 3rd edit. 1826, vol. i. p. 27.

[||] *The Lancet*, vol. ii. 1859, p. 336; and *The Brit. Med. Journ.* Dec. 1866, p. 730.

[¶] The cases of Sherwin and Watson are cited by Mr. Hamilton (*Dublin Journal of the Med. Sc.*), vol. xiii. pp. 51, 54, 1838.

[**] *Dublin Journal of the Med. Sc.* vol. xiii. pp. 41 and 43, 1838.

[††] *De l'Asphyxie locale ou gangrène symétrique des Extrémités.* Paris, 1862.

Section II.—General Features and Rules of Treatment of the various Affections caused by an Irritation of a Nerve.

The following features usually characterise cases of neuralgia, paralysis, epilepsy, and other affections brought on by a peculiar influence, exerted upon, or through, a nervous centre, by an irritation of a nerve.

1st. Previous to the appearance of a remote affection due to such an irritation, the patient has suffered for a variable time from a neuralgia or a neuritis, from a wound or a burn, or from pressure upon a nerve, by either a tumour, a displaced bone, or a foreign body.

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[*] *The Lancet*, vol. xiii. p. 152, 1850.

[†] *Comptes rendus de la Société de Biologie, pour* 1854, p. 76.

[‡] *The Medical Press and Circular*, Jan. 10, 1866.

[§] Beale's *Archives of Medicine*, vol. ii. p. 172.

[‖] I found lately that in some animals the division of the sciatic nerve is almost always followed, in two or three months, by a fall of hair in the neck on the side of the lesion.

[¶] *Gazette des Hôpitaux*, 1846, p. 1; *Gazette méd. de Paris*, 1840, p. 130, and 1845, p. 546; and De Brondeau's dissertation, *Des Affect. sympath. de l'un des Yeux à la suite d'une blessure de l'autre œil*, pp. 40-46. Paris, 1858.

2nd. An increase or a decrease of the irritation of a nerve is often followed by corresponding changes in the intensity of the remote affections caused by the peripheric nervous irritation.

3rd. The various modes of treatment of nervous and other affections, produced by an influence exerted on the nervous centres by a peripheric irritation, are generally quite unsuccessful so long as this irritation persists unabated.

4th. The various affections produced by a peripheric nervous irritation are frequently cured or relieved at once, or very soon after the removal of their cause, viz. the irritation.

I may add a few other characters, more or less implied, however, in the preceding: 1st. When remote affections due to a peripheric nervous irritation occur by fits, it is not rare to see the fit suddenly produced (completely or incompletely) when the diseased nerve is irritated by pressure, or otherwise (application of galvanism, for instance). 2nd. Narcotics, applied to the diseased nerve, will very frequently diminish, at least for a time, the remote affection, even, sometimes, when it consists in, or is connected with, a notable alteration of nutrition.

The above characters may all serve for the diagnosis of remote affections caused by a peripheric nervous irritation; but the only essential one consists, of course, in the pre-existence of a lesion of a nerve. It must be remembered, that if the trunk of a nerve is inflamed, all the symptoms spontaneously mentioned by the patient may seem to him to exist only at the terminal ramifications of that nerve. There is but one way to ascertain what the starting-point of these symptoms is: it consists in the examination, by pressure, of as much as possible of the whole length of the nerve, from the periphery to the neighbourhood of the brain or spinal cord. Had this rule been applied in the following case, it would not have been published and accepted as a case of reflected influence from a disease of the nerves of the thumb upon the four limbs.

Lady —— was attacked suddenly by an acute pain, soon followed by redness and swelling in the left thumb; and the other fingers gradually were also attacked, and afterwards the fore-arm. There was contracture and paralysis, with hyperæsthesia. The other arm became affected in a similar way; and when the pain was violent, there was paraplegia. No benefit was obtained from powerful narcotic applications on the left thumb and hand; but the patient was cured after the use of a counter-irritant ointment rubbed over the arm.*

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* Case of Pearson, in *Med.-Chir. Trans.* vol. viii. pp. 252 et seq. Pearson does not speak of the spine. Had he examined it, he would have found great tenderness between the shoulders and a little above.

In this case there had been no injury to the hand; there was no neuralgia; and the symptoms observed in the fingers and the fore-arm were those we find in cases of local meningitis, or inflammation of the sheath of nerves, at their exit from the spine. I have seen five similar cases, four of which were cured by counter-irritants applied to the spine.

The wonderfully powerful and varied influence exerted by an irritation of a nerve is not due to pain, but to an action of peculiar incident non-sensitive nerve-fibres, as is well proved by two sets of facts: first, that there may be no pain, and even no sensation of any kind, in certain cases in which, however, a peripheric nervous irritation causes a neurose,* or another affection, as, for instance, in cases of worms in the bowels; secondly, that we every day see cases of pain from neuralgia, or other diseases of nerves, without the production of any remote affection. In only few cases seen by myself or others, was there such an agonising pain as in a patient, in whom a ball had lodged in the trunk of the radial nerve, producing for many days the most excruciating pain, depriving him of sleep, and causing a continued perspiration from his face, without any other marked reflex action than a contraction of the fore-arm upon the arm.†

It may seem quite surprising, and perhaps incredible, that the same cause, viz. an irritation of a nerve, will either produce no effect at all, or produce such a variety of affections as I attribute to such a cause. But those who will take the trouble of studying the variety of effects of a clear cause of reflex action, such as, for instance, the exposure of many people to a cold wind when they come out perspiring from a very warm room, will understand that reflex effects may be exceedingly various, although resulting from the same peripheric cause.

Treatment.—Of the various means of treatment of the reflex and other remote effects of the irritation of a nerve, the most important may be classed into two groups—the local and the general means. As regards the local means, they consist chiefly in applications of revulsives or sedatives, or in an amputation or division of a nerve; while the general means consist chiefly in the use of remedies that will diminish the reflex power, or the morbid excitability of the irritated nerve.

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* See my *Researches on Epilepsy*, p. 17. Boston, 1857.

† Case of Denmark, in *Med.-Chir. Trans.* 1813, vol. iv. p. 48. The patient was cured by the amputation of the arm.

tions, the most powerful narcotics, especially opium, and also other remedies, such, for instance, as the chloride of baryum, may be borne in very large doses without any poisonous effect. It would be impossible to say more as regards the general treatment without entering into details which I have not room enough to give,* and also because the rules must vary considerably according to the kind of reflex affection to be treated, and the special features of each case.

C. E. BROWN-SÉQUARD, M.D.

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* I will refer for details to my work *On the Diagnosis and Treatment of Functional Nervous Affections*, the first part of which, treating chiefly of general therapeutics, was published in 1868.

LOCOMOTOR ATAXY.

ALTHOUGH locomotor ataxy comes more frequently under the care of the physician than the surgeon, yet in the early part of its course the symptoms are so equivocal, and so liable to be mistaken for those which belong to certain surgical diseases, that for the sake of the differential diagnosis alone, a short description of this malady should have a place in every system of Surgery.

Among its chief peculiarities are the progressive development of the most prominent symptoms at intervals of considerable length; the irregularity with which, in the order of time, some of these symptoms make their appearance in different cases, and consequently, the different way in which they are grouped together. It is to these circumstances that we must attribute, in a great measure, the difficulty which frequently attends the differential diagnosis of this disease.

The symptoms observed in different cases on record are the following:—Strabismus, diplopia, amblyopia, amaurosis, ptosis, contraction of both pupils or only of one; shifting pains in different parts of the body, chiefly in the extremities; cutaneous and muscular anæsthesia and loss of sense of temperature; ataxy, or incoordination of voluntary movements; incontinence of urine and dysuria; loss of electro-muscular contractility in a greater or less degree; occasionally but rarely some paralysis of the first, fifth, seventh, eighth and ninth cerebral nerves; spermatorrhœa with loss of sexual power and desire; œdematous swelling of the joints, chiefly of the knees; cardiac and gastric disturbance.

All these symptoms are never associated together in any one case of locomotor ataxy; and, as already stated, the variety of ways in which they are grouped constitutes one of the peculiarities of the disease. Thus, to give a few practical examples, the symptoms are grouped in the following way, and made their appearance in the order of time in which they are mentioned.

Case I. Strabismus and diplopia; pains in the legs with numbness of toes; ataxy or unsteadiness of gait; numbness of fingers, followed by pains in the arms and unsteadiness of voluntary movements, or ataxy; incontinence of urine.

Case II. Great nervousness and external strabismus of right eye, weakness of both legs and of right arm; numbness in dorsum of each foot, in right hand as high as the wrist, and in joints of little and ring-fingers of left hand; slight numbness round the mouth; pains in upper and lower extremities, and in head; ataxy; incontinence of urine and dysuria; some impairment of smell and taste; rachialgia, and griping in the bowels; loss of sexual power and desire.

Case III. Pains with numbness and heaviness of legs; pains in abdomen and chest; ataxy; pains and numbness in hands and arms followed by ataxy; analgesia; incontinence of urine and dysuria, alternately; hæmorrhoids; loss of sexual power.

Case IV. Hæmorrhoids, with pain and numbness in sacrum and perinæum; heavy forcing pains in rectum, with tightness and weight in abdomen. Subsequently pains in legs. Both pupils contracted to size of pin's head; ataxy of movement; loss of taste and smell; impaired sensation and motion on right side of nose; great numbness of feet and legs, and analgesia; numbness of fingers; 'quivering' of muscles; exalted reflex excitability of skin over feet and legs.

In many cases the pains in the limbs are for an indefinite, but sometimes for a very long, period the only precursors of the other symptoms with which they are subsequently associated. They consist of two kinds—the one more or less dull, aching or gnawing, and frequently described by the patient as rheumatic; the other more acute and lancinating, like electric shocks. The former are more continuous; the latter occur suddenly, in paroxysms which last from a few hours to a few days, and as suddenly disappear for an indefinite period. Even during the paroxysm the pain is not continuous, but intermitting, although it may recur in rapid succession at very short intervals, and may either fix on some particular spot, or fly from one part to another with the rapidity of lightning. The parts which most frequently suffer are the lower and then the upper extremities.

In other instances the ocular disturbances are for a long time the only symptoms that excite attention. These consist of internal or external strabismus, or amblyopia followed by amaurosis. In more than one-half of the cases of locomotor ataxy, paralysis of either the third or the sixth cerebral nerve, with diplopia, occurs during the first stage. It not unfrequently makes its appearance quite suddenly—in a moment—on awaking in the morning, and during a state of apparent health. But the peculiarity of this affection is its periodicity. Sometimes it continues only for a few days, sometimes for weeks or months, and then disappears as suddenly as it came, to return, perhaps, at some future period. It may occur only at particular times of the day, during certain emotions, or after the eyes have been much fatigued; or it may persist uninterruptedly from the beginning to the end of the disease. Occasionally the strabismus is double, but more frequently it is limited to one eye. In other cases, where there is no perceptible strabismus, there is nevertheless diplopia or double vision, when the patient looks in some particular direction. The strabismus is not unfrequently accompanied by more or less ptosis and dilatation of the pupil. Sometimes one pupil is dilated while the other is contracted; and sometimes both pupils are reduced to a very small size, when there is no other apparent affection of the third nerve or of the other ocular nerves.

Amblyopia is occasionally one of the earliest symptoms of locomotor ataxy. It rarely disappears, or even remains stationary, but generally increases at a variable rate, and often terminates in amaurosis.

The ataxy, incoordination, or loss of power to control the voluntary movements, is an invariable and essential symptom, which makes its appearance in different cases at different periods of the disease. Occasionally it is first in the train of symptoms, but generally it is preceded for a variable length of time, either by the peculiar shifting pains, or the ocular disturbances already mentioned. According to my own observations, which have been confirmed by those of other investigators, the disorderly movements occur under two different forms. First, they are generally manifested in the lower extremities, as simple unsteadiness of gait; the patient staggers or totters more or less, like a person partially intoxicated. At the same time he frequently complains of heaviness about the legs, of fatigue after walking a short distance, and particularly after standing. When he stands with his feet close together and his eyes closed, he sways about and would certainly fall if he were not supported. Before the disorder is far advanced, he may be able to walk alone while looking straight before him, or sideways on surrounding objects; but, at a later period, he cannot move without looking at his feet.

When the disorderly movement extends to the upper extremities, the patient is unable to dress himself, or button his clothes, to write, pick up a pin, or execute movements of a similar nature.

As the disease advances, another kind of disorderly movement supervenes. This is of a jerking character, and arises from spasm of the muscles, which the will puts in motion but is unable to control; for the patient has lost the power of regulating *the degree of their contraction*. Once excited by the will, the muscles contract spasmodically beyond the degree intended, and flex or extend the limb with a sudden and uncontrollable jerk.

These two kinds of incoordination are associated together in different degrees in different individuals; and, according to my own observations, the first kind is that which generally prevails in the early stages of the disease. At a later period, the second or spasmodic kind of disorder increases. All the voluntary movements are more or less hurried and precipitate. The patient seems to be walking upon springs; he proceeds with a kind of prancing gait, and brings his heels to the ground with a kind of kick. If he attempts to take hold of an object with his hands, he probably thrusts it from him by a spasmodic jerk of the arm.

The motor ataxy is usually accompanied, and occasionally preceded, by cutaneous *anæsthesia*, to a variable degree and extent. The fingers, toes, arms and legs are the parts chiefly affected. The patient commonly feels as if he were walking upon something soft like wool; unless he looks at his feet he is not certain that they have reached the ground. Sometimes he can scarcely feel that he has any feet at all, or seems to be 'walking on air,' or 'on his ankle-joints,' or 'on his hip-joints,' when the numbness extends up the thighs.

Analgesia, or loss of sensibility to pain, is frequently experienced to a variable degree and extent; or painful impressions are conveyed to the sensorium with unusual slowness. In one case that I saw, three or four minutes elapsed before the patient experienced any sensation of pain in the part that had been pricked; and, in another, it was not till after the very long interval of *twenty minutes* that the patient, without being asked, complained of smarting in the part which had been pricked with a needle.

Like the strabismus, the disorders of the urinary organs are remarkable for the intermittence of their attacks. The dysuria and incontinence of urine frequently recur alternately at the same period of the disease.

Spermatorrhœa, followed by loss of sexual power, with or without loss of sexual desire, are among the early symptoms of the malady in a large majority of patients.

Occasionally a very remarkable joint affection has been observed in the course of locomotor ataxy. This was first described by Dr. Charcot of Paris. The knee-joint is almost invariably the seat of the disease, which occurs suddenly as an elastic œdematous swelling. The part is neither red nor painful, nor is there any constitutional disturbance or fever. Like the strabismus and urinary affections, it may last only a short time, or be prolonged and give rise to permanent deformities. In the latter case the bones and cartilages of the joint have been found diseased.

At an early period of the disease, before motor ataxy has made its appearance, and when only one or perhaps two of the other symptoms are present, the differential diagnosis is exceedingly difficult. But whenever strabismus or the peculiar flying pains suddenly attack an otherwise healthy person, they should always suggest the possibility of their being the precursors of ataxy. In a large proportion of instances the strabismus is accompanied by amblyopia; and when it is single, the amblyopia is on the corresponding side.* Even in cases in which other symptoms have been present, and in which the diagnosis was by no means difficult, I have seen operations needlessly performed on the eye by surgeons who were ignorant of the nature of locomotor ataxy. Frequently the disease has been mistaken for incomplete paraplegia. It is not long since I was asked by a surgeon to a public institution to see a case of supposed paraplegia which proved to be a well-marked case of locomotor ataxy.

Pathological anatomy.—In this disease the spinal cord is always altered in structure, and in one particular part. The alteration consists chiefly of a peculiar grey degeneration and disintegration of the posterior columns, of the posterior roots of the spinal nerves, of the posterior grey substance or cornua, and sometimes of the cerebral nerves. Generally the posterior columns retain their normal shape and size in consequence of hypertrophy of the connective tissue which replaces the lost fibres. Corpora amylacea and oil-globules of different sizes are also usually abundant. It is very common to find disintegration of the extremities of the posterior cornua, and sometimes I have found the same kind of alteration in the more central parts of the grey substance. In the latter case the disease is of a mixed nature, partaking of the characters of both locomotor ataxy and ordinary spinal paralysis.

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* Dr. Hughlings Jackson states that the amaurosis of ataxy, as regards its ophthalmoscopic appearance, is unlike the amaurosis from disease of parts within the head. In amaurosis from intracranial disease the optic disc always shows evidences of recent or past neuritis, which is not the case in ataxy.—*Lancet*, January 10, 1865.

Prognosis and treatment.—The prognosis, as might be inferred from the pathological anatomy, is generally very unfavourable. It is chiefly at the first invasion of the disease that any marked benefit is to be expected from the use of remedies. Hence the importance of an early diagnosis. One of the chief objects is to protect the patient from cold and damp, and place him in an equable temperature. A good and wholesome diet, with wine or beer, is generally necessary. With regard to drugs, nitrate of silver appears to exercise the most direct or specific influence on the disease. Sometimes it not only alleviates the pains, but diminishes the incoordination. It should be first given in doses of one-eighth of a grain gradually increased to one grain three times a day, after meals. To prevent it from irritating the bowels or the bladder, it may be combined with opium, with cannabis indica, or with belladonna. For relieving the severity of the limb-pains, which so frequently disturb the patient's rest, there is nothing so efficacious as the subcutaneous injection of morphia, beginning with one-sixth of a grain. I have always found these pains aggravated by constipation, and in this case I get the bowels to act by some means or other. Dry cupping along the spine sometimes affords decided relief. Sulphur-baths have occasionally been of some service. Faradisation has generally been found to be rather injurious than beneficial, but the constant galvanic current has been used with the best results.*

J. LOCKHART CLARKE, M.D.

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* For further information on this subject, see Trousseau's *Clinical Medicine*; Duchenne's *Électrisation localisée*; and my own articles in vol. i. of *St. George's Hospital Reports*, and *British Medical Journal*, 1869.

DISEASES OF THE TONGUE.

THE tongue, an organ of well-known form, to which the sense of taste is chiefly referred, is composed of muscular and of gland-substance, covered by mucous membrane, continuous with that of the mouth and fauces. The more delicate appreciation of taste is limited to the upper surface, where the papillæ of the mucous membrane are remarkably developed. The proper muscular structure is striated, and arranged in two horizontal and many vertical layers; the former, immediately subjacent to the mucous membrane, are to be found on the upper and under surfaces; the latter pass vertically from one horizontal layer to the other, connecting them, but leaving intervals, which are occupied by gland-structures, supplied by ducts opening on the under surface, and secreting a fluid resembling saliva. In the posterior third, the muscular prevails over the gland-structure, which is reduced to two large lateral bodies. Abundantly supplied with nerves and blood-vessels, always in movement, and exposed to many sources of irritation or injury, this organ often becomes the seat of disease.

I know of no well-authenticated instance of atrophy of the tongue, although we have now on record many cases of progressive muscular paralysis involving for the most part not only the tongue, but also the palate and lips: such cases must be referred to diseases of the nervous centres. Congenital tongue-tie is also unknown to me. The frænum, it is true, extends in some cases to the tip of the tongue, when its division may be easily accomplished; but the defect usually produces little or no inconvenience, and the difficulty of utterance with which it is frequently associated proceeds from causes affecting the sensorium. Still the division of the frænum linguæ is an operation somewhat popular, and may be performed without detriment to the patient. Whenever the operation is performed, let it be remembered that the artery of the frænum may proceed from the sublingual and not from the ranine arteries; and that the rule given to keep the point of the scissors downwards towards the floor of the mouth is hazardous. It is better to use blunt-pointed scissors and to cut as little as possible and directly backwards.

Hypertrophy and enlargement of the tongue ('lingua vituli, lingua propendula, macro-glossia,' &c.) is an affection occasionally seen.

Zacchias* relates that he saw at Rome, in 1628, a male infant well made, except that the tongue projected three fingers' breadth from the mouth. The child could suck, and lived to the age of fourteen months, when it died without obvious cause. Bertholin† mentions a case of 'linguæ portentosa magnitudo,' related to him by his pupil Bagdun: a male child, born with the tongue out of the mouth as large as a filbert. As the child grew, the tongue increased to the size of a calf's heart. Sauvages, in his *Nosologia*, speaks of enlargement of the tongue in new-born infants. Percy and Laurent‡ speak of two cases: one a woman, in whom the enlargement was dated from birth, but rapid increase took place at the age of three. The other was that of a boy, aged sixteen, whose tongue hung three inches below the chin, was two inches and a half thick, and filled the mouth. The affection had existed from birth.

In Mirault's case, the man, aged thirty-four, had suffered from infancy; so likewise in that related by M. Maurant.§ In other cases the enlargement is described as commencing in the first or second years, when perhaps the better expression would have been, 'was then first noticed;' for the tongue is an organ in which hypertrophy in a slight degree might be readily overlooked, especially in early life, and before attempts are made at articulation. In a few other cases the beginning of the swelling in adults has been referred to salivation. Hypertrophy of the tongue as seen in infancy is congenital.

The measurement of the tongue in the case of a child of eleven, under the care of Dr. Humphry,‖ was as follows: from the upper lip to its tip, 3½ inches; from the under lip to its tip, 1½ inch; from the angle of the mouth round the sides and tip to the opposite angle, 6¼ inches. The circumference of the widest part, which was about the middle of the protruded portion, measured 6½ inches circular measurement; immediately within the lips, 5 inches. When drawn into the mouth to the utmost possible extent, the tongue measured from the upper lip to its tip 2 inches. The organ was soft and supple, having been kept habitually covered in a bag hung from the head. The papillæ were greatly enlarged, and separated by deep clefts, giving to the exterior of the mass a coarsely granular or warty appearance. The colour of the organ was natural.

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* *Quæst. Med.-leg.* lib. vii. tit. 1. quæst. 9.

† *Hist. Centur.* iii. p. 85.

‡ *Dict. des Sc. méd.* vol. xxvii.

§ *Journ. de Méd.* vol. xv.

‖ *Med.-Chir. Trans.* vol. xxxvi. p. 114.

The opening of the mouth was large; the lower lip everted, and the angles of the mouth depressed, so as to elongate and give a peculiar expression to the face. The orifices of the sublingual ducts, of unusual size, were situated just in front of the edge of the lip; the saliva was continually dribbling from the end of the tongue, the quantity thus lost amounting during the day to more than half a pint. Owing to the constant pressure of the tongue on the mental portion of the lower jaw, a curvature had taken place in that bone just in front of the masseter muscles, in such a manner that a wide interval always existed between the incisors and bicuspids of the two jaws. Even when the mouth was closed, that is to say, when the corresponding molar teeth were in contact, this interval between the incisors measured nearly two inches, being increased by the horizontal direction which the inferior incisors and the alveolar process of the lower jaw had assumed. These were so placed as to form a wide channel, in which the tongue rested.

Dr. Humphry determined to remove the protruding part of the tongue by excision, although he was aware that a fatal case had occurred elsewhere from this practice.* He passed a straight bistoury from below upwards through the organ a little to the left of the middle line, and cutting forwards and outwards formed a left lateral flap. He then secured a vessel. Next he cut across the middle of the tongue, divided the ranine arteries, the movements of the organ being still controlled by means of the prolapsing portion, which was not quite severed. The operation was completed by the formation of an oblique lateral flap on the right side, corresponding with that on the left. The flaps were approximated so as to form a tip, and maintained in apposition by two sutures passing deeply. The hæmorrhage was not very great, and the bleeding vessels were tied without difficulty. A good deal of swelling of the tongue followed the operation; but under frequent washing and fomentation it soon subsided, and the wound healed. At first the lips could not be approximated, and the thick stump of a tongue was always visible, though never protruding. After a few days, however, by continued action of the orbicularis muscle, the mouth was closed. An apparatus was then constructed to act by pressure on the deformed jaw, and ultimately a result was obtained highly creditable to the operator.

The effect of continued pressure on the enlarged tongue is a mode of treatment only applicable to early cases, and is uncertain in its results. In a case under the care of the late Mr. Crosse, the swelling, partly removed by this method of treatment, soon returned, and the relief appears to have been imperfect. Some surgeons have treated such a case by ligature; but to this proceeding an objection offered itself in the formation of a slough occupying the anterior part of the mouth, and in the immediate proximity of the nostrils.

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* A girl, aged fourteen, in whom the enlarged tongue hung out of the mouth three inches, was under the care of Mr. Syme, who removed the prolapsing part by oblique incisions meeting at an angle in the centre of the tongue, and united in the middle line by sutures. The child died a few days after, from inflammation and swelling of the tongue and parts about the larynx.

The écraseur is an instrument generally unsuited to operations about the mouth, fauces, or tongue; but may be advantageously used whenever there is fear of uncontrollable hæmorrhage. There is this disadvantage attending its use: that as the chain becomes tightened, it draws nearer and nearer to the limits of the disease, so that when the operation is completed and the part removed, the line of section will often be found in dangerous proximity to the diseased structures. I think that the fear of dangerous hæmorrhage is somewhat exaggerated, except in the case of operations performed at the root of the tongue.

Acute inflammation of the tongue, attended with sudden enlargement, is a disease occasionally seen. Mr. S. Cooper remarks that it may arise spontaneously, and without any apparent cause; or else from some particular irritation, such as that of mercury or some poisonous substance.*

He mentions that, in the middle of the seventeenth century, Schlegel, who was at Paris, saw a patient in salivation, whose tongue became so enormously enlarged that the mouth could not contain it. Pimprenelle, an eminent surgeon of the time, was sent for, and amputated one half of the organ; a measure which Louis criticises as extremely violent.

The disease to which I now refer, however, proceeds from occult atmospheric causes. The swelling is sudden, perhaps occurring during the course of the night, and it produces feelings of threatened suffocation, having been preceded by loss of appetite and a general sensation of *malaise* for a few days.

The first case which came before my notice was that of a gentleman aged sixty, of remarkably abstemious habits, living chiefly on vegetable diet; the second, that of a young married lady, residing in lodgings in a healthy part of London. In this latter case the swelling of the tongue was so great that the mouth could not be closed; the teeth became coated with sordes, and a profuse watery and highly fœtid discharge flowed without intermission for many days. The patient feared to close her eyes in sleep; and so difficult was the respiration, that at one time the question presented itself, whether it might not be necessary to make deep incisions into the swollen organ, or even to open the trachea. However, by constant attention to cleanliness and gargling, by the local use of ice, by supporting the strength with wine and quinine, and the administration of nourishment by enemata during a short time when deglutition was impossible, the swelling subsided, and the patient recovered. For some weeks, however, she remained in an enfeebled state. I saw about the same time two other cases in St. Bartholomew's Hospital. In both the disease was rapid in its course, the accession lasting but a few hours, and the swelling usually subsiding within a week.

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* *Surg. Dict.*, ed. 1830, p. 1102.

But during the period of acute œdema of the tongue, the patient may die suffocated; and the surgeon should bear in mind that such an accident may be prevented by his making free and deep longitudinal incisions into the swollen organ. 'I have seen a patient,' observes Mr. Erichsen, 'who was nearly suffocated by the immense size of his tongue, relieved at once, and get nearly well in the course of a few hours, by such incisions.'* These incisions should be made along the upper, rather than the under surface of the tongue, that the ranine artery be not wounded; and there is but one caution: the œdema may so far involve only one side of the tongue as to cause the lower surface, which yields the more readily, to be turned *directly upwards*, in which case the incision made above passes in truth into the tissues normally inferior. Such a case happened in the practice of Mr. Wormald, who found that, upon the subsidence of the swelling, the incision made above gradually acquired a directly inferior position.

I have known tracheotomy deemed necessary in such a case, although the symptoms do not usually demand it. The condition of the mouth prevents the administration of medicines during the acute stage. Afterwards we must be guided in the selection of remedies by the state of the pulse. Should there be much fever, saline and diaphoretic remedies are suitable. But more commonly the indication is to support the strength, by the administration of tonics, wine, and nutritious diet. For the mouth, a gargle containing alum, or borax and honey, or tincture of myrrh, may be used; and the surgeon may give much relief by carefully wiping away the thick viscid secretion from the teeth, and by touching any ulcerated spots with a weak solution of nitrate of silver.

In the Museum of Guy's Hospital there is a preparation of a portion of a tongue, weighing two ounces and three drachms, removed by ligature by the late Sir Astley Cooper, in consequence of enlargement following salivation produced by mercurial medicines in the treatment of syphilis. And another preparation (1672) illustrates the extreme effects of mercury, namely, mortification of the organ; a result extremely rare, and due to the injudicious and long-continued administration of this powerful agent.

Abscess.—I have seen several cases of abscess of the tongue.

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* *Science and Art of Surgery*, 3rd ed. p. 804.

One case was that of a lady of middle age under the care of Mr. Stanley. She had a firm tumour, the size of a large pea, embedded in the substance of the tongue. Considering the patient's age, and the symptoms attending the formation of the tumour, Mr. Stanley could not dismiss from his mind the idea of carcinoma. But its situation in the middle of the substance of the organ militated against that idea. He made an incision into the mass, and a small quantity of healthy pus escaped. The wound cicatrised, and the lady has continued in good health ever since. Mr. Erichsen [*] says, 'abscess of the tongue, though rare, occasionally occurs. A boy was brought to me some time ago with an elastic fluctuating tumour of slow growth and about the size of a small plum, situated deeply in the centre of the tongue. On puncturing it, about half an ounce of healthy pus was let out, after which the cyst speedily closed.' Other similar cases are met with scattered through medical literature, and they show that the gland-follicles of the tongue are liable to suppuration.

Chronic ulceration.—'The most frequent forms of disease in the tongue,' observes Sir W. Lawrence,[†] 'are, ulceration, generally superficial, sometimes more deeply seated; swelling and thickening of the mucous membrane; swelling and induration of the substance of the organ. Ulceration often exists in conjunction with swelling of the mucous membrane and with induration of the lingual substance. The more formidable diseases of the tongue are syphilitic or cancerous; the former being by far the most numerous. Disorder of the digestive organs is sometimes the source of the mischief, giving rise to affections which are usually superficial, but sometimes of more serious character. When maintained by imprudent indulgence in drinking, there is often a sore state of the organ, the epithelium being smooth, reddened, or white and opaque. When the surface is superficially ulcerated, the ulcerations are generally small, circular, and of greyish colour; occasionally there is thickening of the mucous membrane, and deeper ulceration.' In the same volume of the *Medical Gazette* (p. 800), Sir W. Lawrence relates some cases in illustration of these points.

A healthy-looking gentleman, between forty and fifty, who had always enjoyed excellent health, but who had lived freely, became the subject of the following condition of the tongue:—the mucous membrane over the greater part of the organ was unnaturally smooth, more or less opaque and white, here and there raw, as if it had been ulcerated. It had been in this state, generally causing great pain, for four or five years. Under a course of mild mercurial medicines, the employment of tincture of myrrh as a gargle, and abstinence from strong drink, the pain ceased in a week; and the general condition of the tongue was improved, although the surface remained smooth and white, but otherwise sound.

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[*] *Science and Art of Surgery*, 5th ed. vol. ii. p. 359.

[†] 'Clinical Lecture' reported by Mr. Coote, *Medical Gazette*, 1845, p. 703.

A lady, between fifty and sixty, of unhealthy appearance and with a red pimply face, who had often suffered from disorder of the digestive organs, consulted the same surgeon for a disease of the tongue of formidable appearance. The middle and upper part of the organ was swollen, and occupied by a deep ulcer of irregular figure and foul aspect. It was very painful, interfering with mastication and articulation. The digestive organs were much disturbed. The complaint yielded speedily and effectually to simple measures, regulation of diet and the digestive organs, small doses of extract of henbane, and soothing local remedies. Some years ago a patient, about fifty years old, came from the country to consult Sir W. Lawrence. The man was of sallow aspect, and had lived freely. On the upper surface of the tongue, in a space about an inch and a half long by an inch wide, the mucous membrane was thickened, indurated, and raised into irregular prominences, which were smooth and not ulcerated. The complaint had existed some months, having become so painful that he could hardly take food; washes and gargles had been of no benefit. There was no suspicion of syphilis in this case; and the habit of drinking, especially spirits, sufficiently accounted for the disease. Sir W. Lawrence prescribed the compound decoction of sarsaparilla with compound decoction of aloes three times a day, four grains of the extract of hyoscyamus at night, and a strictly regulated diet. When again seen at the end of a fortnight, all the pain had ceased, and he could masticate anything. He considered himself well, and returned to the country. I saw a tall, spare-looking man, aged sixty, March 18th, 1860, in whom the gums had shrunk from the teeth, leaving the roots denuded to the alveolar border, and exposing them to an accumulation of tartar. The patient had lived freely, having been a publican. The whole of the tongue was swollen, smooth, and of glistening red hue. There was no trace of the papillæ, except at the base, where the papillæ circumvallatæ appeared hypertrophied. In those situations where the organ rubbed against the exposed and roughened teeth, the mucous membrane was white and thickened, and seemed to surround numerous small and unhealthy-looking ulcerations. I directed this patient to have the teeth examined and cleaned by a competent dentist; imposed a strictly regulated diet, ordered a gargle containing alum, and occasionally aloetic aperients. Considerable improvement took place; but after a time the patient declined to attend to the strict regimen which was considered necessary.

This smooth glazed condition of the tongue differs from that commonly seen in persons suffering from chronic dyspepsia, though habitually abstemious. In these latter cases, the mucous membrane has a red, uneven, and raw aspect; it is deeply fissured, ulcerated in spots; the papillæ may be universally or partially hypertrophied, or portions may acquire between the fissures a 'knobbed' aspect. It is important to distinguish these different affections, and to trace the morbid changes to their proper cause. Above all, it is necessary to distinguish them at the earliest stage from those more serious affections, syphilis or cancer. The former appears in a variety of forms, and under circumstances perhaps unexpected. The latter, more definite in its symptoms, is, however, often masked at its commencement by circumstances which will demand all the surgeon's accuracy of diagnosis. Induration of the tongue is said to be of syphilitic nature when it occurs in the centre of the organ, and to be of cancerous nature when it commences at the margin. And this is generally true; but yet there may be an indurated condition of the tongue neither malignant nor syphilitic.

A hatter, aged sixty-one, of unimpaired constitution, who had never had syphilis since the age of eighteen, found that whenever he had been exposed to the fumes of some secret composition used in his trade, the tongue became sore, cracked, and dry, and remained so two or three days. For the last three years it had swelled and become painful during the winter months, but returned to its natural state with the approach of warm weather. About four months before he was seen, the back part and left side of the tongue swelled up in an unusual manner, and became hard. This was attended with a dull aching pain. The surface was uneven and tuberculated, and presented several superficial ulcerations not extending beyond the mucous membrane. The hardness resembled that of scirrhus. The absorbent glands under the jaw were not affected. Iodide of potassium was tried without effect. A course of mercury was next administered, under which the gums became sore, and the organ recovered so much of its normal character that the patient was pronounced convalescent.

Nævus of the tongue.—

On March 15th, 1852, I saw a private patient under the care of Sir W. Lawrence, suffering from congenital venous swelling involving the right border of the tongue. The part had a livid-blue colour, with rounded and irregular surface, marked by large tortuous veins. Sir W. Lawrence made an incision into it, and evacuated a quantity of fluid venous blood, by which the bulk of the tumour entirely disappeared. A ligature was then applied to arrest the hæmorrhage, when there was renewal of the swelling to even a greater extent than before. The venous trunks still communicated one with another. Ultimately the case did well. A student at St. Bartholomew's Hospital showed me in 1853, on his own person, a large congenital venous nævus of the tongue, occupying its right half, including both upper and under surface. At one time it used to bleed: but it had long ceased to cause him inconvenience, and had been stationary for many years. Bearing in mind the fact that nævi may first become stationary during the growth of the body, and ultimately disappear, I recommended this gentleman to let the disease take its course; and I was strengthened in this opinion by the remembrance of an examination made of a similar nævus removed from the anterior part of the abdomen of a young gentleman of about twenty, in whom it was found that the venous swellings were undergoing a process of atheromatous or fatty degeneration, and that no further enlargement was, under ordinary circumstances, to be feared.

There is difficulty in the treatment of such an affection if the growth can be neither tied with a ligature nor extirpated by the knife. An organ so movable and highly sensitive as the tongue does not well bear the application of powerful caustics in any form; and proceedings which are practicable in other parts of the body are here counter-indicated, both on account of the œdema to which they may give rise, and the subsequent pain and difficulty of deglutition. Fortunately, nævi of the tongue are uncommon, and do not usually acquire great magnitude. When extirpation is thought right, the surgeon may remember that the hæmorrhage, though profuse, may be generally controlled by ice. When the ligature is to be applied, it is usually introduced by a strong curved needle; the tongue being drawn forward by an assistant, who holds the organ, covered at the front part by a towel, between the thumb and fore-finger of the right hand. No instrument can press and hold the tongue with the same certainty as the human hand.

On May 17, 1847, Sir W. Lawrence removed a small vascular tumour of the tongue from a young lady aged nineteen. She had previously had removed a vascular tumour from the gum of the lower jaw opposite the incisor teeth, one of which had been extracted. On microscopical examination of the extirpated parts, I found that the papillæ of the tongue, about the centre of the tumour, were hypertrophied and agglutinated into a prominent and flat-surfaced mass of whitish colour. It was composed of white fibrous tissue, of stringy, fibrous matter, and of an immense quantity of mucus and of epithelial cells. It seemed, upon section, as if the follicular portion of the mucous membrane was much enlarged and hypertrophied, and covered by altered and thickened papillæ.

Mr. Paget says, 'In the Museum of the Middlesex Hospital is a fatty tumour, one and a half inches long, which was removed from beneath the tongue, where it looked like a ranula; and in the College Museum, No 190, is one taken from the substance of the tongue.' This surgeon also states that he removed an oval bilobed tumour, about half an inch in diameter, from the tongue of a young man, from the substance of which, near its apex, it had been growing for three years. It was firmer than most others of a similar kind, yet succulent, and formed of an obscurely filamentous tissue, abundantly nucleated.*

Ranula is a fluctuating, semi-transparent, livid-blue swelling, situated under the tongue, and is commonly described as a dilatation of the duct of the submaxillary gland (Wharton's duct). Doubts are now entertained by many authors of the accuracy of this description, and Mr. Erichsen questions how so small a duct can be dilated to so large a size as is occasionally attained by these tumours. This doubt, however, disappears when one reflects upon the enormous size which the minute ducts of the mammary gland may attain in sero-cystic sarcoma.

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* *Surg. Path.* vol. ii. pp. 98, 119.

In one case of ranula under the care of Sir W. Lawrence, the little finger could be inserted for a short distance into a cylindrical tube, pursuing the normal course towards the gland. And in another case under my care, the patient, a domestic servant, presented herself with a hard swelling near the frænum linguæ, which had been pronounced 'a cancer.' Upon examination, I detected in Wharton's duct one of those phosphatic concretions, about the size of a pea, common to the ducts of the salivary glands; it was removed with ease, and the patient recovered in a few days.

But cysts may form in the floor of the mouth from any of the causes which lead to the development of cysts in other parts of the body.

Many years ago Sir W. Lawrence requested me to give him assistance in the following operation. A young lady had a swelling on the floor of the mouth. It was firmer and more solid than the common ranula. Sir W. Lawrence made an incision through the mucous membrane, and endeavoured to extirpate the cyst entire; but finding it too large, he made an incision into it, and, with the handle of the scalpel, took out a quantity of thick matter, the consistence of putty. He then removed the entire cyst, which was but loosely attached to the surrounding parts. The patient recovered.

Then we meet with other cases in which a cyst, containing a fluid of watery consistence, extends from the floor of the mouth under the sterno-mastoid muscle to the middle of the neck. Such a tumour can scarcely be regarded as an enlargement of Wharton's duct. The proper conclusion seems to be, that cysts may form in this situation from four sources. First, dilatation of Wharton's duct. Secondly, dilatation of one of the sublingual ducts. Thirdly, dilatation of a mucous follicle. Fourthly, dilatation of a bursa mucosa, said to exist on the outer surface of the genio-hyoglossus muscle. The contents of a dilated Wharton's duct are a perfectly clear and thick albuminous fluid of the consistence of white-of-egg; occasionally we meet with phosphatic concretions. An enlarged mucous follicle is filled with a putty-like substance consisting of epithelial cells filled with granular fat. An enlarged bursa, which may extend down the neck, contains a clear serous fluid, in which blood-discs may be from time to time detected in various quantities. I have no information respecting dilatation of the sublingual ducts.

The mode of treatment varies in these different forms. In the first case, the most prominent part should be seized with a pair of sharp-pointed forceps, and cut away with scissors. The interior may then be rubbed with nitrate of silver. The duct will contract to its normal size. In cases of cysts containing putty-like matter, the cyst, which is generally but loosely attached, should be dissected out entire. And in the case of the enlarged bursa, the fluid may be evacuated by a trocar, and a solution of iodine then injected; or the cyst may be traversed by a seton, so as to excite inflammation, and its subsequent obliteration. Mr. Skey employs a single silken thread passed through the floor of the mouth to the most depending part of the cyst; and I have seen benefit result from this treatment.

the best is to draw off the fluid and inject with a solution of perchloride of iron ʒi to the ounce of water – 5 minims.

The tongue is subject to injuries of various kinds; the most common of which are those inflicted by the teeth in the convulsive fits of epilepsy. There are instances known where a portion of the organ has been completely severed by the spasmodic closure of the mouth; but the injury is rarely of a nature to require a suture. Wounds heal very readily; and a foreign body, however small, is irritating to the mouth. But a suture may, if necessary, be applied. In the Museum of Guy's Hospital there is a specimen (1674) showing a piece of tobacco-pipe embedded in the substance of the tongue; the soft parts had closed over it, so that its presence was not readily detected during life. Frequent hæmorrhages ensued; and the case proved ultimately fatal. Fatal hæmorrhage rarely occurs from a simple wound of the tongue. The bleeding generally ceases upon the application of ice.

Ligature of the lingual artery above the great cornu of the os hyoides in the neck, for the purpose of controlling hæmorrhage from the ranine artery, is recommended, but is rarely required.

Syphilitic affections of the tongue are mostly ulcerative, and combined with secondary symptoms in other parts of the body. The most common sequence of symptoms is an indurated primary chancre, followed by glandular enlargement in the groin, syphilitic lepra, ulceration of the tonsils, soft palate, and tongue, and iritis. But ulceration of the tongue, as well as the other forms of constitutional syphilis, may follow any variety of primary sore. Syphilitic induration of the tongue may occur alone, in which case it has been mistaken for cancer. The diagnosis is not always easy.

A female, aged thirty, servant in a family of respectability, presented herself at the hospital, with a foul ulcer of the tongue on a hard base, situated between the middle line and the edge of the organ, midway between the base and the apex. It had existed three months; there were no other symptoms. After due consideration, it was thought that the disease was syphilitic; and she was put upon the proper remedies, namely, two grains and a half of mercury and chalk three times a day, when the ulcer healed, and the induration disappeared. We then learned that the patient had suffered from syphilis, under peculiar circumstances, which it is unnecessary here to relate.

A gentleman, aged forty-five, consulted Sir W. Lawrence with an indurated knot the size of a sixpence on the middle of the dorsum of the tongue. It had resisted common treatment, but yielded to a slight mercurial course. No other constitutional symptom of syphilis was present, and the primary sore, which was little more than an excoriation, had happened eight months before.

From the upper surface of the tongue there may project a mass of hypertrophied epithelium, which, blended together, constitutes a mass analogous to the mucous tubercle commonly seen about the scrotum, the vulva, or anus. For the treatment of syphilitic affections the reader is referred to the proper section.

Cancer, as it affects the tongue, usually occurs in one of two forms: either interstitial deposit, when it is called scirrhus; or more superficial development, when it is called epithelial cancer, or epithelioma. Both forms are of serious nature. I have not hitherto known any well-recognised case in which, even after the most complete and early removal, the cure has been permanent. In both instances microscopic investigation detects the usual elements of cancer, namely, nucleated cells and connecting tissue.

We have first to inquire what is the cause of cancer of the tongue. Is it due to local irritation, such as is excited by an irregular or broken tooth? If such were the case, how infinitely more common should it be! how frequently should we notice its ravages in the mouth! Many experienced dental surgeons deny that irregularities in the shape of the teeth will do more than determine the exact seat of development of cancer in constitutions previously so disposed; and the same may be said of the irritation excited in other ways. Let us take, for example, the irritation produced by a clay-pipe. How many are there who smoke unaffected by cancerous disease to the end of a long life! How often have we to remove carcinomatous or cancerous growths from the mouths of persons who have rarely or even never smoked at all!

I lately extirpated such a tumour from a man aged seventy. He had lived a most abstemious life, and had rarely indulged in any luxury, however humble. The wound of the tongue cicatrised; but the patient died eight months afterwards of secondary disease in the glands of the neck.

Still the irritation excited by the constant presence of a tobacco-pipe cannot be ignored. In 1848 I examined the body of Major-Gen. D., aged sixty-three, a patient under the care of Sir W. Lawrence, who gave me the following history of the case. This officer had been above thirty years in India, where he had lived freely. He was always in the habit of smoking a short clay-pipe, the end of which he kept firmly wedged between the floor of the mouth and the under surface of the tongue. About July 1847, he noticed a slight impediment to swallowing; the food, as he said, was caught in its passage through the fauces. A physician applied caustic, but without avail; the disease increased, and the left side of the tongue became swelled and hard. The patient died June 19th, 1848, without particular suffering, and rather from exhaustion than from suffocation. On examination after death, a deep ulcer was found, the size of a shilling, with red and raised edges, on the left side of the under surface of the tongue. It perforated the root of the organ, and spread on the dorsum into an ulcer three inches broad and two inches from before backwards, in which direction it involved the soft palate and tonsils, and had destroyed the epiglottis and the aryteno-epiglottidean folds. The aperture of the glottis was nearly blocked up, and disease spread into the interior of the larynx. There had been little or no hæmorrhage during life. There were six or seven small absorbent glands, infiltrated by masses of opaque yellowish-white matter. The morbid growth consisted of epithelial cells, and similar bodies were embedded in the tongue along the course of the penetrating ulcer. This gentleman's father had lived to a very advanced age.

Hard cancer or scirrhus of the tongue commences as a firm and incompressible knob on the edge of the organ, situate often opposite the last molar or wisdom tooth; or so far towards the root that it is often beyond the reach of surgical interference. The patient at first complains that the tongue is sore, and he often attributes this symptom to the irritation of an unsound tooth, and the uncontrolled movements of the jaw during sleep. Soon the act of deglutition becomes painful: the patient fears either to eat or drink; a sharp pain extends along the Eustachian tube towards the ear; the saliva flows from the mouth profusely. The symptoms become aggravated during sleep; the nights are disturbed by the secretion accumulating in the throat and exciting cough. Often the patient is roused by a painful compression of the tongue between the jaws; and as the ulceration extends, hæmorrhages occasionally supervene. Sooner or later the submaxillary absorbent glands become enlarged by the same cancerous deposit, when first a circumscribed and then a diffused tumour forms in the neck, covered by thin and reddened integument, which, should the patient survive a sufficient length of time, ulcerates, leaving a foul open sore, discharging a thin fœtid fluid, with occasional hæmorrhages. But with the progress of the disease emaciation supervenes, and the patient dies with the usual cachectic indications of cancer.

But this is not the only form of malignant disease affecting the tongue.

In 1847, Mr. Ceely of Aylesbury removed from the tongue of a patient a soft, friable, and irregularly-lobulated mass of reddish-brown colour, with vascular red points, but without any distinct arrangement of vessels, composed of caudate or club-shaped cells with large nuclei, blood-discs, and a thickish matter coagulable in alcohol. The tumour, said Mr. Ceely, when examining it immediately before its removal, protruded from the mouth; the tongue was thrust to the left side, and was swollen; the lips were œdematous; the surface of the tumour was in many places black, and a sero-sanguineous fluid oozed from its upper part. By retracting the angles of the mouth, and directing the patient to thrust the tongue forward, and at the same time raising the tumour over the lower lip, it was brought so far forward as to become girt round its broad base by the whole circumference of the mouth, where it remained fixed. It then felt quite elastic, and measured longitudinally five inches, transversely three inches. While it was in the above situation, I placed my fingers, continued Mr. Ceely, under the tumour, and gently raising it from the base I peeled it off, when a large jagged surface was left, which was soon covered with coagula from bleeding vessels. The hæmorrhage was moderate, and easily repressed with the matico-leaf in coarse powder. The portion removed very much resembled recently detached placenta, though perhaps less firm; it was a spongy, granular mass, with interstitial fluid blood; it had none of the shaggy filamentous appearance of cauliflower excrescence detached from the uterus. The weight of the mass removed was seventeen drachms and a half. On April 8th, 1860, Mr. Ceely reported that the man was still alive, although the morbid growth was reproduced within a week.

I saw near to Town, in 1848, a patient in whom there was scarcely any vestige of tongue remaining, the whole organ having been affected with a similar friable degeneration. The patient could still articulate, and suffered less than might have been expected.

In 1860, a patient under the care of Mr. Harle, surgeon, of Islington, presented himself at the hospital, in whom a portion of the upper surface of the tongue, the size of a sixpenny-piece, was occupied by an opaque white layer or mass, consisting of thickened epithelium, rising above the level of the surrounding parts. Under the microscope the substance was seen to consist of epithelial scales, dried and deformed, and containing but few nuclei. There was no tendency to indefinite propagation, as in cancer, nor to any implication of the neighbouring tissues. The papillæ under the white mass seemed enlarged.

There was no swelling of the neighbouring absorbent glands. The disease had existed twelve years without material change; the patient was a healthy woman aged forty, and no surgical interference was indicated. But when this white mass was raised, and the state of the papillæ seen beneath, the resemblance to epithelioma was obvious. And it was found, by microscopic examination, that the softer epithelial cells carried out this resemblance further. That the disease was not of cancerous nature was proved by the history; no source of local irritation was discovered by the most careful examination; and the case served to illustrate the fact, that in malignant disease there is something beyond the mere increase of the epithelial elements. It was in all probability of this character that a tumour, called supposed epithelioma of the tongue, partook, which was presented to the Pathological Society, December 6th, 1859.* It was taken from a patient aged seventy-nine; had existed sixteen years, and had been six years under observation. It involved the tip, the right half and the left side of the tongue; the pharynx and larynx were atrophied. After death, an examination of the body was made, when no malignant disease was found elsewhere. In 1857, I saw a similar case under the care of Mr. Ceely of Aylesbury. The patient was a sailor, of very intemperate habits; and about fifteen years ago he presented himself with a small epithelial growth on the tongue about the size of an almond.

A cancerous tumour of the tongue should be extirpated, when possible, by the knife. The patient must sit in a chair, with the head supported: chloroform had better not be given in simple cases, because the concurrence of the patient is needed. An assistant grasps the tip of the tongue, covered with a towel, between the fore-finger and thumb of one hand, while with the other he pulls back the cheek. The surgeon then seizes the tumour *completely* within the blades of double-hooked forceps, and with a sharp round-pointed knife, of somewhat large size, sweeps away the enclosed mass in a few seconds. The whole tumour must be grasped with the forceps, that none be left behind. The hæmorrhage renders any subsequent examination troublesome. The knife should be round-pointed, that none of the arteries on the floor of the mouth be wounded. It may be curved in different ways, according to the fancy of the operator; but a straight knife is always the best. The hæmorrhage must be controlled by ice. An artery which commonly needs a ligature is the sublingual; and this can only be wounded by the surgeon using a sharp-pointed knife. No ligatures or sutures are usually desirable to the wounded tongue; they irritate the mouth, and excite the flow of saliva. The cut surfaces granulate and heal, leaving perhaps an elevation of the substance of the tongue, from its being puckered up at the seat of operation.

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* *Path. Soc. Trans.* vol. xi. p. 240.

This, however, can be distinguished from the reproduction of disease by the absence of induration.

The écraseur has supporters as a proper instrument for the performance of these operations. When both lingual arteries may be divided, it is to be preferred to the knife, and M. Chassaignac has amputated the tongue close to its base with this instrument. As the disease threatened to involve the entire organ, its complete extirpation was resolved on. Two or three days before undertaking the operation, M. Chassaignac passed a drainage-tube from without round about the base of the tongue, immediately above the great cornu of the os hyoides. The point where the tube was introduced was a little to the right of the middle line. Having thus prepared a passage for the chain of the écraseur, the tube was withdrawn as soon as the chain was in position. Then commenced the separation of the organ. Two minutes were allowed to elapse between each movement of the instrument; and the transverse division of the organ was effected in exactly half an hour. The chain was then passed behind the base of the separated organ, and made to embrace the muscles and tissues attached to its under surface. In thirty minutes more this second part of the operation was completed, so that the entire time occupied was exactly one hour. The quantity of blood lost was quite insignificant, and the poor man did not evince great suffering. On the eighth day after the operation he was going on well.* A subsequent account reports the patient's recovery. A yet more serious and complicated proceeding consists in the introduction of the chain round the root of the tongue by means of an incision into the floor of the mouth from without. A second chain is required to free the severed tongue from the muscles and soft parts; this double operation takes about one hour for its completion. The jaw has been divided at the symphysis and the two halves pulled asunder in order that the surgeon might gain more room for passing the chain down to the root of the organ. But the amount of space thus obtained does not equal the surgeon's expectations.

When the cancerous degeneration is limited to the side of the tongue, no such proceeding can be necessary, for the severed arteries are but small. But when the operation involves an extension beyond the mesial line, so that one or both ranine arteries must be cut across, and that, too, towards the base of the organ,

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* *Med. Times and Gazette*, May 14, 1859.

—under such circumstances the écraseur may be used with advantage. With it may be combined the employment of the ligature, as in the following case.

In 1859 I removed by the knife a cancerous mass from the left side of the tongue of a man aged forty-two. The hæmorrhage was considerable, the wound being very deep; but it ceased after the prolonged use of ice. The parts cicatrised completely, and the patient left the hospital apparently well. In ten months the disease returned in the cicatrix, and the patient came to me with the request that I would again remove the hardened parts, in order to give him even temporary relief from pain. As the induration extended quite to the mesial line, and the ranine arteries would of necessity be divided, I proceeded as follows:

Chloroform having been administered so as to produce complete insensibility, the tongue was drawn from the mouth by an assistant; the chain of a small écraseur, armed with a needle, was then passed through the middle of the tongue beyond the base of the tumour, and made to cut from within outwards, so as to sever the posterior connections. Next a slight incision was made with scissors into the point of the tongue, so as to guide a ligature round the remaining attachment of the partially severed mass. A strong knot was tied, the prominent part cut away, and the patient was removed to bed.

In December 1861, Mr. Nunneley described, before the Royal Medical and Chirurgical Society, the particulars of an operation for the complete extirpation of the tongue, in which it was asserted the cure had been permanent for some months. A small incision was made anterior to the os hyoides through the integument, mylohyoid, and geniohyoid muscles, by which a curved needle, to which was attached the chain of the écraseur, was introduced so as to carry the chain completely round the base of the organ. In consequence of some imperfection in the chain, it was removed; strong whipcord was substituted, and tied with all the force possible. During the course of treatment hæmorrhage supervened, but it was easily arrested by a solution of tannin. Ultimately the organ came away, and the wound cicatrised. Some doubt, however, was expressed by the Society as to the exact nature of the disease.*

The tongue has been completely extirpated by the knife. Regnoli has removed large portions by making an incision into the floor of the mouth from one angle of the inferior maxilla to the other. But Mr. Syme first, and subsequently Mr. Fiddes,† have extirpated the entire organ, by making an incision through the lower lip, chin, and lower jaw, pulling aside the two halves of the bone, and dissecting the diseased mass, which is by these means fully exposed, from the os hyoides. Mr. Fiddes points out the importance of securing one lingual artery before the other is divided. He has operated thus twice, and speaks well of the results of his cases. The proceeding has not, however, yet found favour generally with modern surgeons.

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* *Med. Times and Gazette*, Dec. 21, 1861, p. 648.

† *Edin. Med. Journal*, June 1859.

Now, in cancer of the tongue the greatest distress to the patient arises, first, from the pain in every movement of the organ, extending to the ear and over the side of the head; and secondly, from the profuse flow of saliva, which keeps him constantly wet and unable to articulate with comfort. The idea of diminishing the sensibility of the tongue, and of checking the excessive secretion by the division of the gustatory nerve as it lies close to the ramus of the jaw, suggested itself many years ago to Mr. Hilton;* and Mr. Moore, of the Middlesex Hospital, has recently repeated the operation.† By dividing the gustatory nerve, he remarks, between the disease and the brain, all the consequences of the irritation of that nerve are necessarily suspended. No sensation from the tumour can be conveyed along it; no reflected irritation can reach the collateral branches of the fifth nerve; no stimulus to an exaggerated secretion of saliva can be given to the salivary glands. A patient on whom this operation has been performed should speak more freely, and swallow with less difficulty; should be relieved of pain in the tongue and jaw, temple, and crown of the head, and of the incessant annoyance arising from the dribbling of saliva; he should sleep better, and be better nourished than before.

The mode of performing the operation, as adopted by Mr. Moore, differs in some respects from that adopted by Mr. Hilton. The latter surgeon sought for the nerve in the floor of the mouth, and exposed it by making an incision along the mucous membrane close to the sublingual gland. The former divides the nerve just behind the last molar tooth, as it escapes from the cover of the pterygoideus internus muscle. It is not more than half an inch distant from the tooth, and is covered only by mucous membrane.

The guide to the nerve is the last molar tooth. On passing the finger into the mouth, within and beyond that tooth, the bulging alveolar ridge can be felt narrowing as it ascends into the thin ramus. Behind, below, and parallel with the ridge, is a shallow groove in the bone. The nerve passes along that groove. Therefore an incision three-quarters of an inch in length made within the mouth and down to the lower jaw behind the last molar tooth, and in a direction crossing the course of the nerve, must divide it. It is advisable to operate with a curved bistoury, since the alveolar ridge might shield the nerve.

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* *Guy's Hospital Reports*, vol. vii. p. 263.

† *Med.-Chir. Trans.* vol. xlv. p. 47.

The patients have expressed themselves relieved; the tongue being rendered completely numb.

Mr. Moore has combined with this operation ligature of the corresponding lingual artery, so as to cut off as much as possible the supply of blood to the affected part. The results are sufficiently encouraging to merit further trial.

It must be remembered, however, that there are ulcers of the tongue of very unfavourable aspect, which are not cancerous.

A patient, aged thirty-seven, had an ulcer of the tongue of eight months' duration. It was situated on the right half of the tongue, and had a coarsely granulated base, with inverted edges and undermined margin exposing the muscular tissue. The patient died labouring under severe tubercular disease of the lungs, and after death there were found tuberculous deposits both in these organs and in the larynx, but no trace of cancerous disease.*

The rule, therefore, holds good that in cases of doubtful ulceration of the tongue, all sources of irritation, such as the sharp edge of a decayed tooth, &c., should be removed, and great attention should be paid to the general health before we arrive at a final diagnosis.

HOLMES COOTE.

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* The preparation is preserved in the Museum of St. Bartholomew's Hospital.

DISEASES OF THE NOSE.

I. AFFECTIONS OF THE EXTERNAL PARTS.

Acne Rosacea. Gutta Rosacea vel Rosea.

THE skin of the nose is especially liable to the various morbid conditions commonly included under the term 'Acne Rosacea.' The appearances presented vary greatly in different cases. They depend not only upon the stage the malady may have reached, but also upon the particular form or variety which may be under observation. In most cases, however, if not in all, the earliest symptoms are due to excessive injection, followed by congestion of the superficial capillaries of the skin. Sooner or later the sebaceous follicles usually become involved to a greater or less extent. But these organs are not the parts primarily affected. Hence many authorities* object to the application of the generic term 'acne' to the affections under consideration.

In the simplest, and perhaps most common form of acne rosacea, the skin at the spot affected is more or less intensely red, and generally has a somewhat shiny, greasy appearance. There is no obvious swelling or deformity of the part. A sense of heat is often experienced by the patient. This, however, is not constant, but comes on after food, or after exposure to changes of temperature. The tip or one side of the tip of the nose is often the only part affected. Occasionally the part looks as though it had been *frost bitten.*

In another and more severe form the greater part or whole of the countenance presents an unnatural degree of redness; and numerous dilated and congested vessels, ramifying in the skin, can be seen by the naked eye. The tint varies according to circumstances from a brightish red to a dusky purple. Sometimes the sebaceous follicles are involved, and the surface of the skin becomes more or less marbled and irregular.

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* See especially Erasmus Wilson, *Diseases of the Skin*, p. 208.

These two forms of acne rosacea are much more common among women than among men. In women they are most frequent at the age of puberty, and at the climacteric period. In men they most frequently occur at the commencement of the decline of life. They do not appear to result from habits of intemperance, but are rather due to disorders of the digestive system, to exposure to the weather, and in the female to menstrual irregularities.

There is a third form, however, especially affecting, and often confined to the nose, which is most frequently, if not invariably, met with among men who have been habitual 'spirit drinkers.' It is rarely if ever seen in any one under fifty years of age. The 'spirit-drinker's nose' is more or less swollen and shiny and greasy. It is of a dusky or purplish red colour, and somewhat cold to the touch. On close examination the skin is seen to be traversed by numerous distended blood-vessels, but between them its appearance is comparatively natural. The sebaceous follicles are generally enlarged and inflamed; and the aspect becomes irregular and pimpled. At a later period the swelling increases, and the nose becomes protuberant. Its surface is covered with tubercles or blotches, or studded by minute pustules, or disfigured by adhering scales and crusts. The cutaneous venules are greatly distended, and sometimes varicose; and their dark purple ramifications become characteristically manifest.

Treatment.—Attention to the general health is in the first place necessary. But very diverse treatment is required in different cases. Disorders of the digestive system, and sexual irregularities must be especially inquired into, and if possible corrected. There is usually more or less general debility. In some instances tonics and stimulants are useful from the first; in others free purgation is indicated as a preliminary measure. Any such habits or practices as may seem to have caused, or to aggravate the local capillary congestion upon which the affection primarily depends must be avoided. Moderation in the use of alcoholic drinks must be insisted on; and in some cases total abstinence may be advantageously enjoined. But general treatment alone rarely suffices to restore the reddened nose to its natural condition. Local remedies are requisite, and in recent cases are often speedily efficacious. In the early stages and when the affection is slight, frequent bathing during the day with water as hot as can be borne, and bathing every night and morning with a weak tepid solution of bichloride of mercury (gr. j. or ij. to ℥j.) may be recommended. Wilson advises washing with cold water and juniper tar or carbolic acid soap twice daily: the ablution is to be followed, if much irritation is produced, by the application of benzoated zinc ointment. Subsequently an ointment of hypochloride of sulphur is to be rubbed in.* According to Hebra† (and Alibert) sulphur in the form of a soap, or an ointment, or as a solution of liver of sulphur, is the best application. The part affected is to be thoroughly washed at bed-time with soap and water. The remedy is then to be well rubbed in, and not washed off until the following morning. In some obstinate cases the chloride or the iodide of sulphur in the form of ointment may be used with advantage. It must be borne in mind that the various applications mentioned are all of them more or less stimulating and irritating, and that therefore (as pointed out by Hebra) the immediate effect of their application is apparently to do harm; and 'it is only after a little time that the good which they do becomes evident.'

In cases of greater severity and longer standing, in which the cutaneous vessels are much distended, and the swelling of the part affected is considerable, Hebra recommends a number of longitudinal incisions to be made into the dilated veins, especially those of which the loops are visible. After the blood has flowed for a little time, the parts are to be touched with a brush dipped in the Liquor Ferri Perchloridi. Very little reaction follows. This method of treatment has been followed by very satisfactory results. In some instances it has been necessary to repeat the scarifications on several occasions. Scarification of the vessels without the application of the perchloride is not, as a rule, effectual.

INTEGUMENTARY HYPERTROPHY. LIPOMA NASI.

In cases of acne rosacea of long standing and severe form, the integumentary structures of the nose sometimes become irregularly hypertrophied, and 'fleshy excrescences' or outgrowths result.* These outgrowths vary greatly in the degree of development they attain, and the appearances they present. In some instances they are scattered, sessile, and wart-like. In others they are aggregated and flattened, and extend more or less uniformly. In others again, they are pedunculated, and form irregular globular or lobulated masses, which give rise to great disfigurement. In extreme cases they hang down as far even as the chin, and interfere with respiration and speech. Sometimes they project upwards to such an extent as to obstruct the vision of one eye or both, so that the patient cannot see objects in front without changing the position either of his head, or of the nasal protuberance. They are generally dusky or purplish in colour, and somewhat cold and greasy to the touch. They rarely occur in individuals under fifty years of age, and scarcely ever in women. They appear to be less frequently met with now than in former times.

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* Wilson, op. cit. p. 211.

† Hebra, *On Diseases of the Skin* (Sydenham Soc. Translation), vol. ii. p. 334.

When cut into, these growths present a brawny consistence; and in places they are occasionally almost as hard as cartilage. They consist of hypertrophied and infiltrated skin and connective tissue, with dilated venules, and enlarged sebaceous follicles. They never involve the cartilages or mucous membrane, nor do they encroach on the interior of the nostrils. They contain, as a rule, little or no fatty tissue. Hence their common appellation (lipomata nasi) is obviously inappropriate.

Treatment.—The only treatment that can be recommended is removal by the knife. In operating, the growths may either be simply cut off one by one; or an incision may be made in the median line down to the cartilage, and the skin with its outgrowths dissected off on either side. Care must be taken not to cut through the cartilages. During the operation, the surgeon or his assistant should keep a finger in the nostril to serve as a guide. The bleeding which ensues may be readily checked by pressure or by the application of styptics. There is much less danger of erysipelas and other serious results than is commonly supposed. The exposed surface usually heals favourably under cooling and soothing applications. When cicatrisation is complete, it is remarkable how little disfigurement remains. In some rare instances there has been recurrence of the growth after extirpation.

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* Hebra describes these 'fleshy excrescences of the nose' as characterising 'the third degree' of acne rosacea. Other authors include them under the term 'acne hypertrophica.'—Hardy, *Leçons sur les Maladies de la Peau,* p. 115.

LUPUS.

Lupus exedens in a large majority of cases first attacks, and most seriously affects, the skin of the nose. So also does lupus erythematosus, but in a somewhat smaller proportion of cases. Lupus non exedens, on the other hand, most frequently commences on one or other of the cheeks or lips, but in its onward progress it often invades the nose. Hence it might appear that only the first named form, and perhaps the second, demand special description in the present Essay. But all three forms of lupus appear to be associated with similar constitutional peculiarities; and they present, in their course and results, certain characteristic phenomena which are common to all of them. Moreover in some cases the distinctive features of the form under observation are not well marked; or two forms may exist at the same time in different parts. In other cases one form may seem to pass almost imperceptibly into another. For example, what is lupus non exedens on the cheek may become lupus exedens when it invades the nose. And thus even the different described forms and varieties of this affection may be regarded as only so many different modes of expression, as it were, of the same, or of a nearly similar morbid condition. It is scarcely possible, therefore, to discuss thoroughly any one form of lupus without reference to the others.

All the forms of lupus are ordinarily classed among those affections which are considered to denote the strumous or scrofulous diathesis. All occur most commonly, if not invariably, during youth or adolescence. All present the following characteristic phenomena. First, infiltration of the skin (or mucous membrane) by material of imperfect organisation and low vitality; secondly, slow, insidious, and progressive destruction of the normal tissues; thirdly, absolute persistence of more or less depressed scars after cicatrisation;—in other words, deficient restoration of the parts destroyed.

Notwithstanding the close relationship thus indicated as existing between them, it is nevertheless of some importance to distinguish the different typical forms of lupus one from another.

The broad distinctive features generally recognised are as follows.

Lupus exedens and lupus non exedens in their earlier stages are papular, and become tubercular by aggregation and union of papules. So far they resemble one another, but the papular stage is less commonly observed in lupus non exedens than in lupus exedens. In their more advanced stages they differ. In lupus exedens ulceration takes place. This ulceration is at first superficial, but subsequently eats more or less deeply into the subcutaneous tissues. In lupus non exedens no true ulceration occurs; but atrophy, degeneration, and absorption of the dermic structures in turn ensue. Lupus erythematosus appears as a circumscribed red patch, which is scarcely perceptibly, or only very slightly elevated, and neither papular nor tubercular in appearance. Atrophy and absorption subsequently take place, as in lupus non exedens without ulceration, but the destructive process does not as a rule extend so deeply. It is stated that in some cases the papillary layer only of the corium is destroyed.

We may now proceed to discuss some of the more special points in the history and treatment of each form of lupus.

Lupus Exedens. Noli me Tangere.

This form of lupus usually commences on one or other of the alæ, the tip, or the columna of the nose. It may commence either in the skin or in the mucous membrane; or it may attack both simultaneously, in which case its progress is as a rule comparatively rapid.

Like the other forms of lupus it occurs most frequently among young people, or among those who are about entering upon adult life.* It sometimes commences during early childhood, but very rarely, if ever, after middle age. It is somewhat more common among females than among males, and is especially prone to affect those who are of fair, or even rosy complexion, with thin delicate skin, auburn hair, and light grey or blue irides. It is associated, as a rule, with other indications of strumous constitution or tendency in a more marked degree and more constantly than is certainly the case with lupus erythematosus, and perhaps also than with lupus non exedens.

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* Out of 298 cases of Lupus Exedens which have come under my observation, or of which I have collected notes, in 173 cases, or about 58 per cent., the patients were females. The average age at the time of observation was 17 years; but in many cases the disease had commenced much earlier than when first under observation. The nose was affected in 93 per cent. of the cases.

On first inquiry or merely superficial examination, it may appear that the general health of the patient is good. On careful investigation, however, evidences of more or less functional derangement of the chylopoietic viscera may generally be discovered. The tongue is redder than natural, especially along the margins, and towards the tip; and the middle portion is often covered by cream-coloured fur, through which the red papillæ project. The breath is more or less offensive. The evacuations from the bowels are irregular and unhealthy. Other symptoms of 'strumous dyspepsia' often present themselves. The processes of assimilation, nutrition, and sanguifaction are carried on feebly; and there is usually more or less general anæmia, with pallor and flabbiness of tissue.

Lupus exedens first shows itself as one or more red or brownish-red papules which increase very slowly in size, and often remain for a long period without manifesting any obvious change. After a time other papules spring up around or between those which originally appeared, and all becoming gradually blended together a tubercle is formed. The tubercle at first may be about as large as a lentil or small horse-bean; but it is liable to considerable variation in extent and prominence. Its surface may be smooth or covered with thin white scales. At a later period one or more minute yellowish specks appear. These increase in number, and become more or less distinctly pustular, and irregularly confluent. The epidermis becomes raised, and then gives way, and, with the ill formed purulent secretion and tissue débris accumulated beneath it, soon dries up into a thick greyish-yellow crust. On removing this crust an uneven ulcerated surface is exposed, which bleeds slightly in some places, and in others is covered by a peculiar semi-purulent viscid exudation which speedily concretes on exposure to the air. A new crust is thus formed, and beneath it the ulcerative process goes on. The crusts vary in thickness and general appearance according to the quantity and relative proportions of the materials entering into their composition. They vary also in the degree of intimacy with which they adhere to the subjacent surface. The ulcerating surface is in some places papillated or mammillated and red, in others depressed, excavated, and comparatively pale, or greyish yellow. Its edges are somewhat jagged in outline, but bevelled, and almost or altogether on the level of the surrounding skin, which is more or less reddened, but rarely swollen or indurated to any noteworthy extent. This process goes on slowly and insidiously. Fresh papules, tubercles, and 'pustules' appear at various points around the circumference of the ulcerated patch; and the ulceration gradually extends until a more or less considerable portion of the countenance is involved. The skin, with the hair follicles, sebaceous follicles, and sudoriparous ducts, and also sometimes portions of the subcutaneous areolar tissue, are liable to be destroyed in turn. But the destructive process rarely penetrates deeper, except in and about the nose and eyelids. In the nose, the cartilages and the small muscles which move them are often destroyed; and great deformity results. This, as may readily be understood, most frequently occurs in cases in which the mucous membrane is simultaneously affected. Sometimes even the nasal bones and the vomer may suffer to some extent. But the graphic descriptions given by the older writers (as well as by some modern ones) of the direful ravages of 'lupus,' seem to apply to the effects of rodent cancer rather than to those of the malady now under consideration. The distinction between these two affections is sufficiently clear, as will be hereafter shown; and the distinction is one which for practical reasons must be carefully made.

While the processes of destruction and ulceration thus described are extending circumferentially, it very often happens that processes of repair and healing commence centrally, and gradually spread. In such case the ulceration may become for a time more or less 'serpiginous' in character. In this way, perhaps after months or years, cicatrisation at length advancing more rapidly than ulceration, and the disease having as it were worn itself out, a natural cure may result. Sometimes, however, and somewhat more frequently, the destructive process seems to stop short. The surface loses its irregular papillated appearance; the excavated spots become pink; the secretion is diminished in quantity, becomes thicker and for a time more truly purulent in character; and cicatrisation commences at the circumference, and gradually advances towards the centre.

The cicatrices are at first covered by a thin shining epidermis, through which the red remaining portions of the corium or subjacent tissues can be seen. After a time the epidermis increases in thickness; and the cicatrices become paler, but are traversed by slightly elevated lines or ridges radiating from a centre, and are sometimes marked here and there by small blood-vessels. Still later the cicatrices become almost white, and more or less contracted, and irregularly depressed. Their contraction gives rise to various deformities, or increases the deformities already produced by the preceding destruction of tissue. The point of the nose may be drawn down; or one or other of the alæ may be turned upwards, or the eyelids or lips may be everted. The probable stability of the cure may be inferred from the character of the cicatrix. If the new skin is soft and free from tenderness, and soon presents a nearly natural colour, it may be considered sound; but if on the other hand it remains for any length of time unnaturally red and indurated, or if it continues delicate and membranous in appearance, and is traversed by numerous tortuous blood-vessels, there is considerable probability of a relapse.

A well-established tendency to relapse, or to reappearance of the disease in some part before unaffected, is a noteworthy feature in the clinical history of lupus.

The interstitial changes which take place during the progress of lupus have been made the subject of careful microscopical investigation by Wedl, Auspitz, Rindfleisch, Neumann, and others.* It would appear that in the earlier stages the cells of the rete Malpighii multiply rapidly, and become granular and fatty; the corium becomes succulent, and is infiltrated, and more or less distended with new connective tissue elements and rounded or oval cells with nuclei and nucleoli. The subcutaneous areolar tissue is similarly affected to a variable extent. The normal tissues are no longer healthily nourished, and consequently become atrophic. During the later stages the atrophied tissues and the new elements break down, and become transformed into a molecular detritus. This, mingled with fresh exudation, helps to make up the characteristic discharge from the ulcerating surface.

The diagnosis of lupus exedens may sometimes be difficult during the earlier stages. But when the stage of gradually advancing ulceration is reached, the disease is as a rule easily recognisable. The affections with which it is most likely to be confounded are 'common strumous ulceration,' syphilitic ulceration, and rodent cancer. It is of great practical importance to distinguish accurately between these several affections, because each requires different treatment.

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* See Wedl, *Pathological Histology* (Sydenham Society Translation), p. 383; Auspitz, quoted by Bazin, *Dict. encyclop. des Sciences médicales*, art. 'Lupus;' Neumann, *Lehrbuch der Hautkrankheiten*, 1869, p. 218.

'Common strumous ulceration' is by no means constantly preceded by distinct papules and tubercles; and it is not attended in its course by the formation of fresh tubercles around the ulcerated spot. The ulcers are generally deeper than in lupus. Their edges are thin and often undermined. Their surface is either almost or entirely destitute of granulations, or is covered by small pale, flabby granulations, which bleed readily when touched. The surrounding skin is purple or violet, red, or livid. Associated with 'common strumous ulceration' there is often enlargement and sometimes suppuration of the neighbouring lymphatic glands, but this very rarely occurs in lupus.

Syphilitic ulceration, when affecting the nose, generally commences in the pharynx or about the palate, then invades the mucous membrane of the nose, and so extends as it were from within outwards. It usually occurs as a tertiary affection, and is associated with 'syphilitic cachexia,' and other more or less characteristic symptoms. The history of the patient affords in many cases strong presumptive evidence as to the nature of the malady. Syphilitic ulceration, commencing on the cutaneous surface, is often preceded by tubercles. But the tubercles of syphilis are copper-coloured, and are harder and generally larger and rounder than those of lupus. The ulcers of syphilis are foul and sloughy. Their edges are sharply cut, and sometimes everted. The crusts formed are greenish. When syphilitic ulceration extends serpiginously, its outline is generally horseshoe-shaped—not oval or circular, as in lupus serpiginosus.

Rodent cancer is a disease of declining life. It is not associated with indications of strumous tendency, but occurs in those who are otherwise healthy. Its tubercles are hard. It ulcerates very slowly, and eats very deeply into the tissues, destroying all before it—muscles, cartilages, and bones, as well as skin and mucous membrane. It shows no disposition to heal. Its edges are firm, abrupt, and precipitous. It is often accompanied by severe pain.

Treatment.—From what has been advanced, as well as on other grounds discussed elsewhere,* it would appear, firstly, that lupus may be regarded as the local expression of a morbid constitutional tendency; secondly, that when once established 'the lupus process,' if uninterfered with, may go on spreading during an uncertain period, and to an indefinite extent, seeming as it were to propagate itself; thirdly, that sooner or later all the morbid processes come to an end, tissue destruction ceases, and healing ensues.

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* See various authors on Diseases of the Skin; especially Devergie, Bazin, Hardy, Hebra, and Wilson.

The natural termination of lupus which thus takes place may be considered to be due either to the disease having, so to speak, worked itself out, or to constitutional changes, from advancing age or other cause, having rendered the general condition unfavourable to the continuance of the local affection. These views regarding the natural history of lupus are strongly supported by the results of different methods of treatment. And further, they serve to indicate the double direction the treatment should take in order to effect or hasten the cure. Experience has amply shown that, as a general rule, comparatively little permanent good is to be expected from local remedies alone. All sorts of stimulating and soothing applications have been repeatedly tried in vain. In many cases, even after the use of powerful caustics, the characteristic ulceration has speedily recurred when the immediate effects of the escharotic have passed away. So also the most judicious constitutional treatment has been tried over and over again, and persevered in for months, or even for years, without obviously producing any good effect, unless or until proper local treatment has also been adopted. It may, and probably does, occasionally happen that the disease is prevented from becoming established by the early application of caustics, or that when the morbid process has nearly worn itself out, a cure is effected under the influence of constitutional remedies. But in the majority of cases it is better to trust to neither one nor the other line of treatment alone, but to adopt both. And if this be done judiciously, it will be found that lupus exedens is by no means the unmanageable malady it was formerly supposed to be, and that it is far from deserving its common appellation of 'noli me tangere'—an appellation that by misleading may prove mischievous.

In the treatment of lupus exedens it is, in the first place, desirable to correct as far as possible all that may be wrong in the general health of the patient by improved hygiene, and such medicines as are calculated to remove or overcome any disorders of the digestive system that may be found to exist. Good air, good food, including a liberal allowance of meat and fresh vegetables, and some wine or malt liquor, are especially indicated. Sea air occasionally appears to be hurtful rather than beneficial; and in some cases alcoholic stimulants of every kind seem to disagree: but these are probably exceptional cases, although several such have come under my observation.

Various tonics, as the mineral acids, vegetable bitters, quinine, and some of the preparations of iron, especially the syrup of the iodide or the syrup of the phosphate, may be advantageously administered, and varied from time to time—due regard being always paid to the condition of the digestive organs, and to the action of the bowels. But the medicaments which are especially useful, are cod-liver oil, and the liquor arsenicalis, or Donovan's Solution. Cod-liver oil should always be administered in such doses as the stomach will bear. Its influence for good in the large majority of cases is marked and indisputable. In most cases also arsenic appears to be a very valuable remedy. Mr. Hunt, to whom is due the credit of having especially urged, if not of having first suggested, its administration in this malady, considers it 'absolutely a specific.' He seems inclined to rely upon it almost exclusively.* He recommends it to be given in the largest doses, ascertained by careful trial, that the patient can bear continuously without injury. In some cases very large doses are tolerated.† The results of general experience testify to the beneficial effects of arsenic, but seem scarcely to confirm all that Mr. Hunt has said in its favour. Indeed, it is worthy of note that he refers to the possible necessity of continuing the use of the drug, 'month after month and year after year,' and even 'for half a life-time.' Any 'specific' influence it may possess, therefore, may be at best very slow in becoming manifest, and can scarcely be considered worth waiting for, when more speedily effective treatment is at command.

Due regard, then, being given to the general health, and such medicaments being administered as are likely to modify the morbid constitutional tendency, it is, in the second place, of the greatest importance to arrest locally the spread of the disease. This can be effected most speedily and most certainly by the absolute destruction of those parts and tissues in which the

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* See *British Medical Journal*, 1862, vol. i. p. 8; also, *On the Treatment of Lupus*, by J. L. Milton. (Hardwicke.) London, 1866.

† See a remarkable case detailed by Dr. Andrew, in which the patient took half drachm doses of the liq. arsenicalis three times daily for a considerable period.—*British Medical Journal*, Sept. 8, 1866.

'lupus process' is going on. It matters comparatively little what method is adopted, or what particular escharotic is used, provided always that the application is thorough and efficient. It is worse than useless simply to irritate the surface of the sore; and, on the other hand, it is obviously undesirable to penetrate further than needful into the healthy tissues. That method may claim to be the best, which, on experience, is found to be most completely under control during application, and which causes least enduring pain afterwards to the patient. Judged on these grounds, the actual cautery, strong nitric acid followed by nitrate of silver, and chloride of zinc in the stick may be especially recommended. Their destructive action is certain, speedy, and readily limited and controlled in accordance with the judgment of the surgeon. Chloroform may be administered at the time of the application; and the pain subsequently experienced, as a rule, is neither very severe nor lasting. On the other hand, the pastes of chloride of zinc and flour, nitric acid and sulphur, acid nitrate of mercury, arsenious acid and calomel, &c. &c.,* although effective, are open to the objection that, acting slowly, they often subject the patient to hours of agony. Moreover, during their application the surgeon has no opportunity of limiting or controlling their action, nor of judging how far their destructive influence may have penetrated.

The actual cautery may be used in the form of the red or white hot iron, the galvano-caustic wire or pencil of Middeldorpf, or the gas cautery of Bruce. The last named is a very convenient and efficient instrument for use in cases in which the ulcers are small and superficial. The hot iron and the galvano-caustic pencil are more applicable if the ulcers are deep, or if it should be necessary to destroy much tissue.

Nitric acid may be applied by means of a glass rod, a spun-glass brush, or, best of all, a piece of rattan cane frayed out at one end, and cut to convenient size. The acid must be thoroughly applied along the ulcerating edges, and well pressed into the surface of the sore, and into all the irregularities and tiny excavations. After a few minutes the whole surface should be wiped dry and comparatively clean, and then a fresh application of the acid should be made. This process should be repeated until it is clear that all the lupus-affected tissues must have been reached by the caustic. It is then a good plan to rub a stick of nitrate of silver all over the surface, and well into the cauterised tissues. The silver salt assists in forming a good protective scab, and certainly seems to deaden and diminish the pain produced by the nitric acid.

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* The following formulæ may be quoted:—Chloride of zinc 1 part; flour, gypsum, or compound tragacanth powder 3 or 4 parts; water q. s.; mix. Chloride of zinc ʒiv., chloride of antimony ʒij., starch ℥j., glycerine q. s.; mix (Startin). Vienna paste: Potassa fusa and unslaked lime, equal parts; spirits of wine, q. s.; mix. Arsenious acid 1 part, calomel 99 parts (Dupuytren). Calomel ℥ij. ss., bisulphide of mercury ℈ij., arsenious acid ℥j.; mix (Startin).

The solid chloride of zinc in stick is especially recommended by Mr. Hutchinson. It must be thoroughly rubbed along the edges and well pressed into the surface of the ulcer. It is useless simply to touch or wipe over the parts affected: the caustic must be made to penetrate.

In all cases before any escharotic is applied, it is necessary to clear away all crusts and scabs from the surface and edges of the ulcer. They may be softened by bathing with warm water, or by a short application of an emollient poultice, and may then be picked off. If the ulcerated surface and the surrounding skin appear much inflamed, it is better to attend to the general health, and to apply soothing ointments and lotions for a time before proceeding to the use of escharotics. Poultices and water-dressings as a rule are not suitable. In applying the escharotic, care should be taken to follow accurately every extension of the disease on the mucous membrane and into the cavity of the nose, as well as on the cutaneous surface. The escharotic must be applied to every portion of the ulcerating surface, especially to the edges along which extension of the disease is going on; and some portion of the surrounding apparently healthy skin should also be destroyed. The healing edges and the cicatrised portions of the surface need not be touched.

If the patient is under chloroform as recommended, all that seems necessary may be done at one operation. But if the disease is extensive, and chloroform is objected to, different parts may be attacked at different times, one part being destroyed after another.

After the application of the escharotic, the surface should be carefully covered from the air by a little scraped dry lint, and a light pad of cotton wool. This dressing may be kept on until the scab or slough separates, which usually happens in the course of four or five days. Benzoated zinc or lead ointment may then be applied, or such other dressing as may be indicated.

If the escharotic has been thoroughly applied, healing soon commences, and as a rule goes on satisfactorily, provided that the general health is good, and that proper constitutional treatment is carried out. It sometimes happens that repeated applications of the escharotic may be necessary; and this is almost sure to be the case if the former applications have been too superficial, or if the escharotic employed has been too feeble in action. Some surgeons indeed prefer the repeated application of weak caustics to a single application of a strong one. Thus Hebra recommends the application of solid nitrate of silver once or twice a week. Such treatment has proved efficacious in very many cases. Hardy * speaks highly of the efficacy of an ointment composed of equal parts of biniodide of mercury and lard. The ointment of the red oxide of mercury, or that of the ammonio-chloride, or the ointments of lead, zinc, and nitrate of mercury mixed in equal proportions, may also be recommended in cases in which escharotics appear unnecessary, or in which it is deemed desirable to defer their application. These ointments are often very useful also after partial or incomplete cauterisation.

It must be borne in mind that although lupus is not of syphilitic origin, yet it may and sometimes does occur in those who are the subjects of syphilis. In such cases the appearances presented partake of the character of syphilitic ulceration, and the treatment must be modified accordingly. If the syphilitic taint is hereditary, mercurials prove useful. The iodide, mercury and chalk, or the bichloride in small doses may be given. If the patient is the subject of acquired syphilis, and especially if mercurials have been previously administered, iodide of potassium in full doses (twenty to thirty grains) three times a day, and iodide of iron are especially indicated. In such cases it is well to defer the use of escharotics, and to apply black lotion or one of the weaker mercurial ointments.

Lupus Non Exedens.

Lupus non exedens is slower in its progress, and less destructive than lupus exedens. It commences, according to the excellent description of Mr. Wilson,† 'as a small tubercle of reddish yellow, or pale amber colour, and has the appearance of a drop of jelly effused beneath the cuticle. . . . There is no inflammation, no redness around the tubercle, and a few minute vessels may be seen struggling through it, or over its surface.' The tubercle goes on extending, and is joined by others; but the reddish yellow tint and the somewhat 'gelatinised' appearance are preserved. Bye and bye absorption commences; the papillary layers, and more or less of the deeper parts of the corium become removed; and a permanent cicatrix remains. No ulceration takes place. A certain amount of pricking or itching is usually experienced, but as a rule very little pain, or none at all. Sometimes the disease spreads over the greater part of the face, and considerable deformity results.

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* *Leçons sur la Scrofule et les Scrofulides*, p. 89. Paris, 1864.

† Op. cit. p. 422.

Treatment.—The treatment generally should be similar to that recommended in lupus exedens. But it is not necessary to cauterise the parts affected nearly so deeply nor so extensively as in the more severe form of the disease. Caustic potash in solution appears to be especially applicable. Tubercle after tubercle may be destroyed at different times without occasioning much suffering to the patient. Among the constitutional remedies, iodide of iron and iodide of ammonium are found to be more obviously beneficial than in lupus exedens, but arsenic does not appear to be so efficacious.* Cod-liver oil should always be administered in such doses as can be tolerated.

Lupus Erythematosus.

This form of lupus usually appears on the nose; but other parts are sometimes attacked at the same time or subsequently. It is a comparatively rare affection. It differs from the other forms of lupus not only in its non-tubercular character, but also in the fact that it commonly occurs in individuals who are otherwise healthy, and who manifest no indications of strumous constitution or tendency. Its general features have been already described (see page 239).

The dull or purplish red patches, with which it commences, at a later period become depressed, and covered by scales or thin crusts composed of epidermis and dried sebaceous secretion. Still later the scales and crusts separate, and the skin beneath is found to be attenuated and to present a scar-like appearance.

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* Hunt, op. cit.

According to Neumann, in lupus erythematosus the morbid process commences in and about the walls of the sebaceous follicles, which become condensed by accumulation of cells and connective tissue. The follicles lose their acinous structure, become converted into globular bodies with granular contents, and finally disappear. During the progress of the malady the other cutaneous structures suffer to a greater or less extent, and the microscopical appearances more or less resemble those met with in the other forms of lupus.*

Treatment.—In a large proportion of cases local treatment alone is requisite. The patches should be carefully destroyed by the application of strong solution of potash or some similar agent; or the gas cautery of Bruce or the galvano-caustic wire may be used. It is better to proceed gradually, and to repeat the application as often as may seem desirable, rather than to run the risk of destroying the tissues to an unnecessary depth and extent.

CANCEROUS AFFECTIONS OF THE SKIN, ETC.

Rodent cancer.—This formidable malady most frequently commences near the eyelids, or about the margin of the upper lip; but sooner or later, if unchecked, it usually invades and destroys the nose, and gives rise to the most hideous deformity. It occurs in persons who are otherwise healthy and free from all constitutional taint, but very rarely in those who are under fifty years of age.†

It first appears as a hard tubercle, the induration of which is characteristic. The tubercle is almost always solitary at first, but at a later period other tubercles occasionally, though very rarely, appear and join the original one. The tubercle slowly but steadily increases in size, and involves the surrounding tissues. Bye and bye a superficial fissure or excoriation appears, which for a time may be concealed by a scab. But later the fissure or excoriation becomes a deeply-eating ulcer; and the central portions of the growth and the tissues involved by it are destroyed. The process continues. The surrounding tissues are invaded by the solid growth or deposit; they become more or less indurated; and are then in turn regularly eaten away. 'The growth of the solid disease is not limited to the integuments around the ulcerated cavity: it advances in depth as well as in superficial area, involving all the structures it encounters. It infiltrates the glandular textures and the bony, it spreads by the mucous and fibrous tissues, and after perforating the skull, it will still grow into the very substance of the brain. In the succeeding ulceration these structures are likewise removed, and the excavation becomes deep as well as wide.' *

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* Op. cit. p. 230.

† In his excellent monograph *On Rodent Cancer*, recently published (Longmans, 1867), Mr. C. H. Moore mentions a case in which the growth appeared at the age of thirty-three. Mr. Hutchinson met with another in which the patient was only a year or two older.

In the earlier stages there is comparatively little pain, but as the destructive process advances into the deeper parts, and especially when the eyelids are attacked, the patient's sufferings are often very severe. The lymphatic glands are rarely affected.

This malady has been described under the names of 'rodent ulcer,' 'cancroid,' 'Jacob's ulcer of the eyelids,' &c. &c.

Its alliance to cancer is indicated by its clinical history, rather than by its microscopical structure. Its onward progress is certain, though very slow. It never undergoes spontaneous cure: unremoved by surgical aid, it lasts until death.

Treatment.—Constitutional treatment is altogether useless. Complete excision, followed if necessary by cauterisation of the exposed surfaces, or thorough destruction by powerful escharotics, is the only treatment likely to be followed by successful results. Experience shows that by such treatment much good may be done. In many cases a cure has been effected which has remained permanent for years; and in others the ravages of the disease have been checked, and the sufferings of the patient greatly diminished. If the nature of the malady is recognised early, and all the parts infected are at once absolutely removed, the patient may be saved from the most serious disfigurement and the direst suffering. And even in cases in which the disease has made extensive progress, the surgeon should not hesitate to attempt its removal. The results obtained in some such cases have been decidedly encouraging.† In cases in which the disease has not advanced far, and in which the whole can be satisfactorily excised, the space left may be at once covered in by a portion of transplanted integument. But in cases in which the greater part or whole of the nose is destroyed, and the cavity after excision is very wide and deep, it is better to wait until cicatrisation is complete, and subsequently to perform if practicable some reparative operation. If the chasm is too extensive to be covered in by operation, or if the health and powers of the patient cannot be relied on, a mask with an artificial nose, &c., may be worn.

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* C. H. Moore, op. cit. p. 9.

† See cases by C. H. Moore, op. cit.; Hutchinson, *Medical Times and Gazette*, 'On Rodent Ulcer;' also *London Hospital Reports*, vol. ii. p. 136.

Epithelioma.

This form of cancer occasionally, though very rarely, attacks the nose. It generally commences as a small 'wart;' this sooner or later becomes excoriated, and covered by a scab; after a time ulceration commences. In these earlier stages epithelioma closely resembles rodent cancer, and is with difficulty distinguished from it. But epithelioma usually commences just at the junction of the skin with the mucous membrane, or even in the mucous membrane. Rodent cancer as a rule appears in the skin at an appreciable distance from the mucous membrane. In their more advanced stages the distinctions between these two allied affections become more obvious. In both there is slowly progressive infiltration of the surrounding structures with new material, and destructive ulceration extending centrifugally. But 'there is much more solid substance in the epithelioma, and the gaps which it makes by destroying the normal parts, though equally great, are less openly cavernous than in the rodent cancer.'* The outline of epithelioma is less irregularly indented, and the margins are less uniform in thickness than in rodent cancer. In epithelioma too the margins are often everted, and the surface is uneven, and irregularly papillated and sometimes covered with a cream-like juice. In epithelioma the lymphatic glands are very liable to become affected sooner or later. In rodent cancer, as already stated, this is not the case. The generally recognised microscopical characters of epithelioma (see Vol. I. p. 615) are almost or altogether wanting in rodent cancer.

Treatment.—Epithelioma of the nose may be excised, or destroyed by escharotics.

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* C. H. Moore, op. cit. p. 24.

Mr. Ure refers to a well-marked case in which he effected a cure by means of an arsenical paste. He mentions also another case in which an oval epitheliomatous sore as large as a florin was treated first by excision, next by the application of chloride of zinc, then by the application of arsenious acid, and finally healed under the influence of an ointment composed of equal parts of finely-pulverised sulphate of zinc and cerate. The cicatrix was perfect a year afterwards.*

A remarkable case is mentioned by Mr. Moore in the first volume of this work (p. 571), in which an epitheliomatous growth commenced on the nose, and 'slowly spread over the centre of the face until it reached the size of half a swan's egg.' 'The entire surface of the growth was made up of pedunculated rounded tumours no larger than peas, and covered with thin integument.' A very similar case recently came under my care in Guy's Hospital. I removed the growth as completely as possible with the knife, and then cauterised the surface with the hot iron. Cicatrisation took place. But four months afterwards the growth returned, and a second attempt to remove it was followed by an attack of erysipelas which proved fatal.

Scirrhus and encephaloma sometimes, though very rarely, appear upon the cutaneous aspect of the nose; they more frequently invade it from within. These forms of cancer demand no special description here. They should be removed if practicable as soon as recognised; and it is well to cauterise the surface left bare by the knife.

DEFORMITIES AND DEFICIENCIES.

The nose is liable to various deformities and deficiencies. Some of them are congenital; others result from accident or disease. Some are more or less perfectly remediable by operation; others are best concealed by masks or artificial noses, which are now-a-days made and adapted with great skill.

Entire absence of the nose as a congenital affection is extremely rare, but some instances are on record.

In the case of a female infant under the care of M. Maissonneuve,† the nose was represented by a plane surface merely pierced by two small holes. An operation was performed by which a columella was made from the lower lip. It is difficult, however, to 'see how this could have improved the child's appearance.' (Holmes.)

When the nose has been entirely destroyed by disease, the chasm may be to some extent covered in by operation. But it would appear to be useless to attempt to form a new nose, if the natural and necessary framework of cartilage and bone is altogether lost. Nothing short of an osteoplastic operation would seem likely to be permanently successful. But the practical objections to such an operation in this part are sufficiently obvious; and so far as I have been able to learn, the results of the attempts hitherto made have not been encouraging.

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* See Former Edition of this Work.

† *Bulletin de Thérapeutique*, 1855, vol. xlix. p. 559; quoted by Holmes, *On the Surgical Treatment of Children's Diseases*, 2nd ed. p. 128.

In cases, however, in which some portion only of the nose is wanting, whether as a congenital deficiency or as the result of accident or disease, a rhinoplastic operation may be undertaken, and often with fair prospect of success. In very many instances the most satisfactory results have been achieved (see PLASTIC SURGERY).

Occlusion and contraction of the nostrils.—These deformities of the nose are sometimes congenital, but much more rarely so than corresponding conditions of the ear, the anus, or the vagina. In some instances the nostrils are more or less completely closed by membrane,* in others by firm fibrous tissue, or by simple continuity of integument. In other cases, again, one ala or both may be adherent to the septum, or even to the upper lip. All these deformities interfere with respiration, and prevent the infant from sucking uninterruptedly. The earlier therefore they are remedied by operation the better. In most instances a simple incision of sufficient extent carefully made through the obstructing membrane is all that is requisite. The opening must be kept patent by strips of lint or a short elastic canula, until the cut surfaces are completely skinned over. Sometimes it may be desirable to excise a portion of the obstructing tissue. In cases in which there is no indication of the opening of the nostril, the adherent parts must be gradually and cautiously divided until the nasal fossa is reached. If free respiration is not materially interfered with, or if one nostril only is obstructed, the operation may be deferred for a time.

In a case under the care of Mr. T. Smith in the Hospital for Sick Children, the right nostril had been closed from birth. The corresponding ala was flat and unsightly. The child suffered from snuffling and snoring. The adherent surfaces were divided by the knife, and the opening made was maintained during a period of three weeks by means of a portion of gum catheter. A good result was obtained.†

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* Richerand, *Nosographie chirurgicale*, 4th edit. tome ii. p. 156.

† *Medical Times and Gazette*, March 28, 1863.

Constriction and even complete occlusion of the nostrils may occur at any period of life as the result of accident or disease. A deep burn, a wound with loss of substance, or ulceration, followed by adhesions, or by contraction of cicatrix, may give rise to such a condition. The attendant symptoms are a variable degree of embarrassment of respiration and speech; a troublesome sense of whizzing in the nose; a change in the tone of voice, which becomes more or less 'nasal' in character; and, in certain states of the weather, an uncomfortable dryness of the mucous membrane of the mouth. If the patient suffers serious inconvenience, an attempt should be made to dilate any small opening that may remain by the passage of bougies, or by the introduction of sponge or laminaria tents. If such means fail, incisions should be made in the direction and to the extent indicated by the particular features of the case under treatment. Mechanical dilatation must be subsequently kept up during a considerable period to prevent the contraction which otherwise is almost certain to recur.

Clefts of the nose and fissures extending from the nostril into the cheek or towards the orbit, are occasionally met with. As a rule they may be successfully treated by plastic operations.

Deviations of the nose.—In some cases the nose inclines towards one side or the other. Such deviation usually depends upon a corresponding curvature of the cartilaginous septum. It is often associated with hypertrophy of the anterior extremity of the septum, and of the tip of the nose generally. In consequence of the deviation of the septum, one nostril becomes more or less constricted, and may even be almost completely occluded. Respiration is principally or entirely carried on through the other nostril, and the voice is liable to be affected. This deformity is sometimes the effect of injury, but in many cases its origin cannot be explained. Little can be done in the way of remedy. The attempts hitherto made to straighten the deformed nose by means of mechanical contrivances do not appear to have been very successful. Nor have good results generally followed the removal by the knife of portions of the cartilaginous septum. Such a proceeding, however, is recommended by some surgeons.*

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* Gross, *System of Surgery*, vol. ii. p. 336. Philadelphia, 1866.

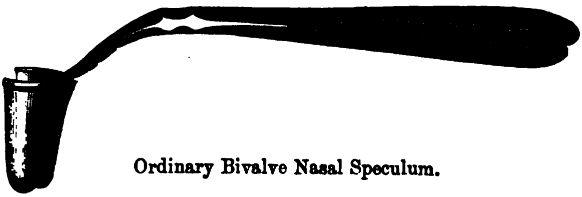
II. AFFECTIONS OF THE INTERNAL PARTS.

The cavities of the nose may be inspected to some extent either through the nostrils, or through the naso-pharyngeal openings by means of a small mirror introduced into the pharynx.* They may likewise be explored to some extent by the finger, or by a probe, passed either through the nostrils or through the mouth, and round the posterior border of the soft palate. But in the normal condition of parts, certain considerable portions of these cavities can neither be brought into view, nor reached by the finger or probe. Hence an absolute and precise diagnosis is often difficult, and sometimes in the present state of our knowledge, and with our present appliances, altogether impossible.

RHINOSCOPY.

Anterior rhinoscopy, or inspection through the nostrils.—In order to inspect the nasal cavities from the front, the nostrils must be dilated, and a good light must be thrown in, either directly, or by reflection from the mirror hereafter described.† The latter method is generally preferable for minute and thorough examination, because by it the light may be concentrated and directed at will, upon different parts in succession, and no obscuration is caused by the head of the observer, as is apt to occur when direct illumination is employed. For the dilatation of the nostrils no instrument is more generally useful than the ordinary

FIG. 225.



Ordinary Bivalve Nasal Speculum.

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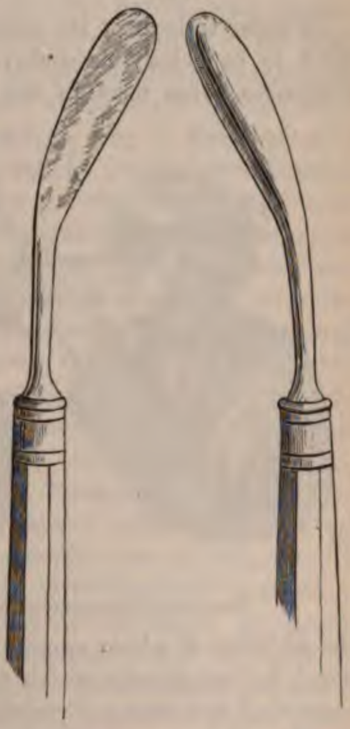
* To Czermak especially, and after him to Semeleder, we are indebted for having first completely demonstrated the practicability and value of posterior rhinoscopy.

† For methods of illumination, &c., see 'Posterior Rhinoscopy,' p. 258, and 'Laryngoscopy' in DISEASES OF THE LARYNX.

bivalve nasal speculum (Fig. 225), or some slight modification of it. Mr. Hilton's modification * is probably the best. He recommends that the blades should be slightly curved, and somewhat longer and broader at the extremities, than they are in the ordinary instruments. The blades are introduced into the nostril to be examined in the closed position in which they are kept by the spring between the handles. By compressing the handles the blades are separated, and dilate the nostril. Their brightly polished inner surfaces help to throw the light into the cavity. The blades should not be introduced beyond the cartilaginous part of the nostril.

Dr. Thudichum's speculum consists of two blades or valves 'held together by a spring.' 'When compressed the valves form a canal of oval bore, about ¾-inch in length. The valve which expands the ala is from ¼-inch to ⅗-inch longer than the valve which is placed against the septum.' 'Each nostril requires its own speculum.' The valves are closely compressed and introduced into the nostril. When the compressing force is withdrawn the valves are separated, and the nostril is dilated by the spring, which also serves as a handle. This speculum has obvious and indisputable merits of its own. But it often occasions pain unless it accurately fits the nostril; and the extent to which the nostril is stretched is not so easily and completely controlled as when the expanding power is in the hand of the surgeon. Such, at any rate, is the result of my experience hitherto.

FIG. 226.



The Nasal Speculum of Dr. Metz.

The speculum of Dr. Metz of Aix-la-Chapelle, consists of two distinct portions. One of them is held in the right, and the

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* Made by Milliken, Southwark Street.

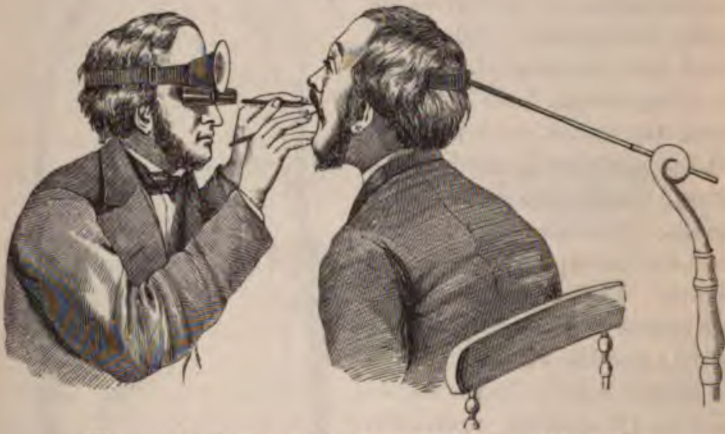
other in the left hand. They may be used together or separately. It is easy to understand how by means of them the nostril may be dilated, and light reflected into the cavity. To prevent dimming of the polished surfaces by deposition of moisture, this as well as the other specula should be slightly warmed before introduction into the nostril.

In some cases, as suggested by Czermak,* a small oval mirror mounted at an angle upon a long slender stem, may be used with great advantage. When such a mirror is introduced to a greater or less depth through the nostril, and properly illuminated, there may be seen reflected in it various parts which could not otherwise be brought into view.

Posterior Rhinoscopy. Choanoscopy. Inspection of the Nasal Cavities from Behind.

In order to inspect the nasal cavities from behind, a brilliant light is especially necessary. The instruments required are similar to those used in the examination of the larynx, with the addition of a long narrow spatula turned up at the end, or a blunt flat hook, with which the uvula and soft palate may be supported and drawn forwards. The rhinoscopic mirror, however, is smaller than any ordinarily used in laryngoscopy, and its stem should be a little longer, and bent somewhat downwards near its junction with the handle. This bend enables the

FIG. 227.



The general arrangements for posterior rhinoscopy by sunlight.

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* Czermak, *On the Laryngoscope* (Sydenham Soc. Translation), p. 33.

operator to keep his hand in such position as not to obstruct the light. Sometimes the stem may be advantageously bent into a double curve, somewhat like the letter *f* reversed.

In making the inspection the same general arrangements are necessary as in laryngoscopy (see Fig. 227). The patient is seated with his back to the light, his head is thrown well back, and his mouth opened as wide as possible, and in such manner as to display the pharyngeal cavity to the fullest practicable extent. The surgeon, seated opposite, by means of the spatula, held in his left hand, raises and draws forward the uvula and soft palate of the patient, and directs the light reflected from the frontal mirror into his pharynx. The speculum held by the right hand of the surgeon is slightly warmed, and introduced with its face looking upwards and forwards. It must be carried well into the upper and back part of the pharynx. The light is then made to shine upon it, by some slight movement, if needful, of the head of the surgeon or of the reflector. When all this is successfully accomplished some portion or other of the walls (or contents) of the naso-pharyngeal or nasal cavities may be distinctly seen imaged in the speculum. By varying the position and direction of the speculum other parts may be in turn brought into view. Under the *most* favourable circumstances, the two superior meatuses may be inspected more or less completely, and considerable portions of the mucous membrane covering all three turbinated bones may be seen; the septum may be examined throughout a great part of its extent, but the view obtained is necessarily very oblique: some portions of the posterior surface of the velum palati may also be seen: lastly, if the mirror is turned towards one side, the lateral wall of the naso-pharyngeal cavity, and the orifice of the Eustachian tube may be brought into view. But the difficulties of posterior rhinoscopy are great, and it is rarely that the cavities may be inspected to the extent indicated: although this is theoretically possible in most cases, and has been actually accomplished in many. Nevertheless, persevering attempts should always be made in doubtful cases. Experience has amply proved that this method of examination, even when incompletely carried out, may afford most valuable aid not only in the diagnosis, but also in the treatment of various affections of the nasal cavities. To insure success considerable practice on the part of the surgeon, and oftentimes great patience and self-control on the part of the patient are requisite.

The principal difficulties arise in the first place from peculiarities in the anatomical conformation and proportions of parts. Thus the opening of the mouth may be small; or the tongue may be disproportionately large; or the posterior nares may be narrow; or the free border of the velum palati may be naturally so near to the posterior wall of the pharynx as to leave little or no available space between them. This last is a frequent source of great difficulty. Such difficulties cannot be removed, though by patience they may be to a certain extent circumvented. Secondly, there are other difficulties of physiological origin. Thus the tongue may be difficult to manage; or the soft palate may be extremely sensitive; or the natural tendency of the velum to become raised, tightly stretched, and closely approximated to the posterior wall of the pharynx, when respiration is carried on through the mouth, may come into play. All such difficulties may generally be overcome by perseverance and practice. The patient may himself depress his tongue by means of a rectangular spatula, or he may learn to keep it well down in the floor of the mouth. The soft palate, though highly sensitive at first, soon becomes accustomed to the steady touch and support of the flat hook, and in some cases may be voluntarily kept in such position as to render the use of the hook unnecessary. It is not improbable, as suggested by Czermak,* that some simple means may be discovered by which the natural sensitiveness of the soft palate may be temporarily diminished. The administration of bromide of potassium, recommended by Gosselin† as a preliminary to the operation of staphyloraphy, appears to me from my own experience worthy of more extensive trial than it has hitherto had, although it has not proved so efficacious as was expected. I have tried the chloral hydrate in some cases, but not as yet in a sufficient number to enable me to express any decided opinion as to its merits. The elevation and tension of the soft palate, and the approximation of the velum to the posterior wall of the pharynx, to which allusion has been made as frequent sources of difficulty, occur naturally when respiration is carried on through the widely-opened mouth. But it is quite possible to breathe almost entirely through the nose, even when the mouth is open. When this is done the parts become at once relaxed, the velum falls, and the associated difficulty is at an end. I have found it the best plan to direct the patient to breathe through the nose as though snoring.

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* Op. cit. p. 76.

† *Gazette médicale*, avril 14, 1860, p. 223.

The method of posterior rhinoscopy thus described is, I believe, the best yet devised for purposes of examination alone. The speculum and the hook which supports the velum may be moved as occasion may require independently one of the other. But in cases in which it is desired to direct the application of remedies by sight, this method has the obvious disadvantage of occupying both hands of the surgeon. Various instruments have been devised in which speculum and palate hook are so connected that they can be held and manipulated by one hand, the other being left free to operate. The best of such instruments yet contrived is, I believe, that of M. Duplay.

NASAL CALCULI. RHINOLITHES.

Calculous concretions are sometimes formed in the nasal cavities. Instances are rare, but a considerable number have been placed on record.

Bartholin relates the case of a young Danish female, who, after suffering for a long time from headache, passed from her nose several calculi, which in size and shape resembled date-stones. Clauder witnessed the case of a woman, sixty years of age, who expelled from her nose a very hard rounded concretion, as large as a hazel nut. Khern noticed several pisiform calculi which had escaped from the nostrils of a young person suffering from violent headache.* Such and such like cases must be taken for what they may be worth. Many others which are well authênticated, are quoted or referred to by Demarquay in his elaborate memoir on the subject.†

These concretions are for the most part met with in the inferior meatus of the nose. They may originate in the frontal or maxillary sinuses, and from thence pass into the nostrils. They vary in size, and increase by the deposition of successive layers. They may even attain such dimensions as to block up the nostrils, and to cause deviation or partial destruction of the septum. They are uneven on the surface, and may be black, grey, or whitish in colour. In many instances they are formed round extraneous bodies, which thus constitute their nuclei. The nucleus may be a bead, a cherry-stone, an incisor tooth, a small detached portion of bone or tooth, or some other body. Often, however, no definite nucleus can be discovered; and in such cases the cause and starting point of the calculous formation remains obscure. Chronic inflammation of the mucous membrane or of the lachrymal gland may possibly give rise to alterations in the secretions leading to depositions of calculous matter. Crust-like lumps of dry hard secretion are often formed in cases of ozæna &c., and if any of these should be retained in the recesses of the nasal cavities it is easy to understand how they may form nuclei upon which successive deposits may be made. Such deposition may also be favoured by certain abnormal anatomical conditions; as for example contraction of the nostril, or narrowing of the lower meatus to such an extent as to hinder the due expulsion of the secretions. Graefe considers that the gouty dyscrasia favours the production of nasal calculi. On the whole it would appear that the most frequent cause is the retention of some foreign body in some part or other of the nasal cavity.

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* Cloquet, *Osphrésiologie*, p. 627.

† *Archives générales de Médecine*, 4ᵉ série, vol. viii. p. 174.

The calculi themselves (according to the analyses of Bouchardat) consist of the phosphates and carbonates of lime and magnesia, chloride of sodium, and mucus or some other animal matter.

The ordinary symptoms are dryness of the affected nostril, accompanied by a sense of weight and fulness; frequently more or less obstruction of respiration; pain of an intermittent neuralgic character referred to the nose or forehead; and sometimes inflammation, and swelling of the adjacent parts, with copious discharge of mucus and pus from the nares. The sense of smell may be impaired or abolished. The eye may suffer sympathetically, and may be suffused or bathed with tears; or there may be epiphora from obstruction of the nasal duct.

In most cases the calculus may be detected on careful exploration of the cavity by means of a probe; or it may be seen on rhinoscopic inspection. The sensation communicated through the probe, and the dull dead sound sometimes emitted when the calculus is struck may be considered diagnostic. But should the calculus be inaccessible to touch as well as to sight, the symptoms manifested may mislead the surgeon. Thus, the presence of a polypus may be suspected on account of the obstruction to respiration that may arise; or some primary affection of the bones may be supposed to exist on account of the deformity of the nose which sometimes occurs, and the accompanying suppuration; or in consequence of the fœtid and disgusting odour frequently exhaled the surgeon may be disposed to put the case down as one of 'idiopathic' ozæna.

Treatment.—The treatment obviously resolves itself into the removal of such concretions as may be discovered, and the careful and thorough washing out of the cavities by means of the nasal douche * or syringe.

There may be some difficulty in removing the calculi, especially if they are firmly impacted in the lower meatus, or if they are situated in the upper part of the nose. The most convenient instruments to use are thin-bladed well-curved dressing forceps, and small scoops. But care is requisite in seizing the calculus, otherwise the pressure of the instrument may only serve to push it on more deeply into the cavity. Forceps made in two distinct portions, which may be introduced separately one on each side of the calculus, and afterwards locked together, (like midwifery forceps) would probably prove most applicable. Forceps made on the principle indicated are invaluable for the extraction of foreign bodies through narrow passages. I have used such forceps during several years past for removing foreign bodies from the ears and nose with the greatest ease and most perfect success. Each blade can be in turn insinuated beyond the foreign body or calculus. But in using ordinary forceps one blade is often necessarily withdrawn while the other is being put into position, and as a frequent result the foreign body is pushed further on instead of being seized. Care must be exercised in extracting the calculus lest from its bulk or by the asperities of its surface the surrounding parts should be lacerated.

A case of calculus of the nose is mentioned in the *Gazette des Hôpitaux* for 1859, in which attacks of intermittent pain occurred. These were at first considered to be neuralgic. Subsequently the symptoms were attributed to necrosis of the nasal bones. Ultimately the calculus was discovered and got rid of by lithotrity at four sittings, at intervals of a fortnight each. The cure was followed by some slight deformity of the nose.

When the calculus is extracted soothing measures must be adopted, as already indicated, to allay the irritation set up, and to cleanse the cavities. If there is reason to suppose that a gouty diathesis or tendency has contributed to the production or increase of the calculous formation, or if any other constitutional taint is discovered, appropriate general treatment should be prescribed, and thoroughly carried out.

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* See p. 276.

EPISTAXIS. BLEEDING FROM THE NOSE.

The mucous membrane of the nose is very vascular: its blood-vessels are numerous, though none of them are very large; they are derived from many different sources, and they anastomose very freely; they form, especially in the young, important media of communication between the vessels within the cranium and those which are distributed externally. The tissues which support them are in close relation with bone or cartilage, and are subject to injuries, abrasions, and ulcerations; and the vessels themselves are liable to become distended and congested from various different causes. Hence it happens that bleeding from the nose is of very frequent occurrence. In a large proportion of cases such bleeding is of trifling importance. In some cases it seems to afford relief, and to be really beneficial. Sometimes, however, it is symptomatic of visceral disease, or of degeneration of blood. Occasionally, if unchecked, or if frequently recurrent, it may prove serious, dangerous, or even fatal. The blood usually escapes from the nose drop by drop, but sometimes it flows in a fine stream. As a rule it comes from one nostril only, rarely from both simultaneously.

Epistaxis may be 'accidental' or 'spontaneous' in origin.

Accidental epistaxis resulting from a blow upon the nose with or without fracture of the bones, is very common. In some boys it may be brought on by a very slight blow, or by any unusual exertion, or even by sneezing, or blowing the nose violently. It rarely goes on to a serious extent.

Spontaneous epistaxis arises from many different causes. It may occur as capillary hæmorrhage consequent upon either active or passive congestion; or it may result from ulceration extending into some one or other of the larger vessels; or it may be associated with, and indicative of, the presence of a polypoid growth.

The spontaneous epistaxis so frequently met with among young people of nervous temperament and delicate skin, is one of the most common forms of capillary hæmorrhage. It is usually preceded by active congestion, which is sometimes associated with over fulness of the intracranial vessels, and accompanied by flushing of the face, buzzing in the ears, and a sense of heaviness or even severe headache. These symptoms are commonly relieved by the bleeding.

In young women capillary hæmorrhage from the nose is occasionally vicarious of suppressed menstrual flow, and under such circumstances may be considered salutary.

Bleeding from the nose frequently occurs in scurvy, and fever, and in other affections associated with an impoverished state of the blood. In persons of hæmorrhagic diathesis it often becomes a source of great anxiety and difficulty.

The epistaxis of declining or advanced life should never be lightly regarded. It is usually preceded by mechanical or passive congestion, which may result from over distension or obstruction of the vessels conveying the blood from the brain, or may betoken the existence of some visceral disease of more or less serious character. The blood that flows is often venous in appearance.

Treatment.—In the treatment of epistaxis discrimination and judgment on the part of the surgeon are demanded as frequently as promptitude and skill. It is one thing to devise and apply the best means for the immediate arrest of the hæmorrhage; it is another to decide whether or not it is better to make the attempt. In very many cases the conditions which have given rise to the bleeding require treatment, rather than the incidental and temporary flow of blood which indicates the existence of such conditions. In some instances the non-recurrence of periodical or habitual epistaxis may betoken the approach of danger; and in others the sudden arrest of the bleeding by surgical interference may be followed by symptoms of the gravest import.

Accidental epistaxis may usually be arrested by the simplest means. So also as a general rule may the spontaneous capillary epistaxis of early life. Cold applications to the nose and forehead, snuffing cold water up the nose, the introduction of a piece of ice into the nostril, and such like remedies are generally efficacious. The nursery remedy of slipping a cold key down the back, or far better of suddenly dashing cold water over the spine, seems sometimes to answer almost magically;—possibly, as has been suggested, through some reflex action excited in the vaso-motor nervous system. In some cases the vertical elevation of the arms as high as possible above the head is successful. The rationale may be considered doubtful, but the fact appears to be well established. This plan has been especially recommended (if not first suggested) by Dr. Negrier of Angiers,* who states that he has never known it fail to arrest the bleeding. It sometimes answers in cases of severe injury. Malgaigne mentions the case of a young man who had sustained a severe fracture of the nose. Cold lotions, &c. failed to arrest the copious bleeding which ensued. The patient was directed to raise his arms perpendicularly. The hæmorrhage ceased almost immediately and did not recur. Dr. Keith of Aberdeen speaks most strongly of the excellence of this method. Another simple and often very effectual method consists in firmly compressing the nostril of the affected side against the septum. Observation teaches that in a large number of cases the bleeding spot is somewhere near the anterior and lower borders of the septum. In such cases it is obvious that the hæmorrhage may be arrested by pressing upon the nostril or nostrils with the finger, or with the finger and thumb. The compression should be maintained for a quarter of an hour or more, and then gently relaxed. The patient should be warned against sneezing or blowing the nose for some time after the pressure has been removed. The efficacy of the method is established by ample experience. Dr. Chapman recommends the application of an india-rubber bag containing water of a temperature of 115° to the back of the neck, and gives some remarkable instances of the success of this mode of treatment.* Dr. Graves † speaks very highly of the good effects of dry cupping in some forms of epistaxis. In all cases the head should be maintained in the natural erect position. If the head is bent forwards the large venous trunks may be obstructed, and congestion and continuance of the hæmorrhage consequently favoured. If the head is thrown backwards or the patient is in the recumbent position the blood may flow backwards, and almost imperceptibly trickle down the pharynx long after all bleeding may be supposed to have ceased.

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* Watson, *On the Principles and Practice of Physic*, vol. ii. p. 795.

If none of these simple methods prove effectual, a stream of cold water containing in solution some astringent may be directed into the nostril. This may be accomplished by means of an ordinary syringe, or better still by the nasal douche (see p. 276). Or some astringent, as the persulphate or perchloride of iron, or burnt alum, or tannic acid, on a dossil of lint or a piece of sponge may be applied to the interior of the nostril; or powdered matico, or tannic acid or persulphate of iron may be introduced either mechanically or by insufflation. But such means, however certainly effectual, should not be recklessly adopted. I have known the introduction of matico cause the immediate arrest of the hæmorrhage with the after consequence of most alarming symptoms.

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* See *Medical Mirror*, February 1, 1870, p. 25.

† *Clinical Lectures*, vol. ii. p. 316.

If these means fail, there remains to the surgeon the easy and certain expedient of plugging the anterior and posterior nares. When this is done it is physically impossible for the hæmorrhage to continue after the nasal cavity is once filled. For want of knowledge of this method more lives than one have been sacrificed. Gross refers to an example.* Two have come under my own cognizance.

The operation of plugging the nares is best performed by means of Belloc's sound. This consists of a silver canula (slightly curved at the distal end, and six or eight inches in length), within which freely slides a stylet some four or five inches longer than the canula. The proximal portion of the stylet is rigid to an extent corresponding in length to the straight portion of the canula. Its distal portion is made of a piece of 'mainspring' which tends to curve round in the proper direction, and is terminated by a perforated button. The operation is performed as follows. The eye of the button is threaded by a long piece of strong silk, and the stylet is drawn up until the button lies against the end of the canula. The instrument thus armed is passed along the floor of the nose into the pharynx. The stylet is then pushed along the canula, and the spring turns round the posterior border of the velum into the mouth. The silk is seized and drawn out through the mouth, and a portion of sponge of sufficient size to fill the naso-pharyngeal opening somewhat tightly is attached to it. The instrument is next withdrawn, carrying with it through the nostril the other end of the silk By means of traction upon the silk and manipulation with the finger, the piece of sponge is then fitted into the naso-pharyngeal opening in such a manner as to block it up completely. Lastly, a second plug of lint or sponge is attached to the other end of the silk, and firmly fitted into the nostril. It is obvious that this operation may be accomplished as effectually, though perhaps not so easily, by various other instruments, as for example a long bent probe, the stripped feather portion of a quill, or a gum elastic catheter. The last named instrument properly threaded throughout its length, and carrying a loop of silk hanging through its eye answers extremely well. The plugs should not be allowed to remain more than about forty-eight hours, for they are necessarily a source of discomfort and irritation, and are liable to give rise to the formation of matter, which may speedily become offensive, and possibly poison the system. Professor Gross* says: 'I have seen several cases where from this cause the patient lost his life, being seized with a low form of fever, attended with delirium, which nothing could arrest. In one of the cases there were marked symptoms of pyæmia.' The plugs may be easily removed by cutting the silk which connects them, withdrawing the anterior plug from the nostril, and pushing the posterior one on into the pharynx, and bringing it out through the mouth by the finger, or a pair of vulsellum forceps, or by means of one end of the silk which may have been left to hang through the mouth. After the removal of the plugs the cavity of the nose should be thoroughly but gently washed out.

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* *System of Surgery*, vol. ii. p. 333. Philadelphia, 1866.

In all cases of frequently recurring epistaxis, and especially in those which depend on constitutional causes, it is of great importance to carry out the general treatment which the circumstances of the particular case may indicate. Rest, avoidance of excitement, and general hygienic measures must be enforced. In some cases it may be desirable to administer gallic acid or acetate of lead for a time; but much more frequently, especially if the strength has been reduced by repeated bleedings, ferruginous preparations, and *par excellence* the tincture of the perchloride of iron, are indicated.

It is almost needless to add that if the epistaxis is due to the presence of a polypus, or to any specific ulceration, no permanent good can be effected until the polypus is removed, or the ulceration is partially or completely healed.

CORYZA.

The term coryza designates a symptom rather than a disease. It implies an excessive discharge of mucus, or 'running' from the nose. The discharge may be watery and clear, or glairy and thick, or even muco-purulent. It may depend upon catarrhal, strumous, or syphilitic affections, or upon the presence of a polypus. So long as there is no well characterised fœtor, the term coryza is applicable. But if the discharge becomes horribly offensive, or if it has been so from the first, the term 'ozæna' is employed.

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* *System of Surgery*, vol. ii. p. 334. Philadelphia, 1866.

Catarrhal inflammation of the pituitary mucous membrane, or to use the popular designation 'a cold in the head,' is by far the most frequent cause of acute coryza. This common malady needs no discussion here; but it is worthy of note that many different affections of the nasal mucous membrane, and even polypoid growths are often incorrectly described as taking origin from 'severe and repeated colds.' In some instances, doubtless, such an explanation is correct. But in others the coryza and other symptoms are the effects and indications, rather than the causes of the development of the special malady that may have arisen.

Chronic catarrhal inflammation is often attended by troublesome persistent coryza, and associated with more or less inflammatory thickening of the mucous membrane, and consequent obstruction to free respiration. This condition is most liable to supervene in delicate strumous children, or youths of either sex. In some cases local treatment by means of mild astringent washes, or the insufflation of powders of similar character, conjoined with general measures, appears to be beneficial. A warm dry atmosphere, good nourishment, tonics, and cod-liver oil are indicated in most cases of long standing. Occasionally superficial ulceration occurs in cases of simple catarrhal inflammation, whether very acute or of long standing. But such ulceration as a rule is very slight, and, although painful for the time, very soon heals. It rarely causes the discharge to become fœtid.

Hypertrophy of the Pituitary Membrane.

The pituitary membrane sometimes becomes thickened and hypertrophied throughout the whole or greater part of its extent, both nostrils being equally affected. More frequently, however, the thickening is limited to those portions of the mucous membrane which cover the inferior turbinated bones. The mucous membrane of these parts is naturally thick; and its thickness depends, according to Kölliker,* not only upon its numerous glands, but also upon the presence of abundant, almost cavernous, venous plexuses in its substance. This affection is always associated with coryza. Sometimes it follows long-continued coryza. Sometimes it appears to arise spontaneously, from some general or constitutional, rather than local, cause. But in such case it is usually attended by more or less copious watery or mucous discharge, although the tumefaction itself occasionally appears dry on the surface. The other symptoms usually are a sense of discomfort, more or less interference with free respiration, and a variable degree of alteration of the voice. On inspection a red opaque swelling may be seen, somewhat velvety in appearance, and solid to the touch. The extent as well as the precise situation of the swelling varies in different cases, but it is usually symmetrical. Sometimes the turbinated bones are themselves affected, and become unnaturally soft, porous, and swollen. This affection, especially if confined to the mucous membrane covering the anterior and lower parts of the turbinated bones, may be mistaken by the patient, and even on casual examination by the surgeon, for polypus. But there is no difficulty in making the diagnosis. The non-pedunculated, broad attachment of the swelling, its immobility during respiratory efforts and on pressure by the probe, together with its redness and opaque (not semi-transparent, glistening) appearance, serve to distinguish hypertrophy of the mucous membrane from polypus. It is important, however, to bear in mind that this condition may be, and indeed often is, concomitant with the existence of polypus in the upper part of the nasal cavity, and that its presence may conceal the polypus from view.

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* *Manual of Human Histology* (Sydenham Soc. Translation), vol. ii. p. 417.

A case recently came to my knowledge in which a surgeon removed a small polypus from a patient who was also suffering from hypertrophy of the mucous membrane. Another surgeon seeing the case declared that there was no polypus, that a grave mistake had been made, and that no operation ought to have been performed. The consequences were not satisfactory. The polypus was allowed to increase, to the extreme discomfort of the patient, until its existence became indisputable, and its removal far more difficult than it would have been at an earlier period.

Treatment.—The hygienic measures suitable in strumous affections generally may be recommended. Cod-liver oil and the syrup of the iodide of iron often seem to do good. Locally, a single leech may be applied to the swollen membrane, or numerous fine punctures may be made with a needle. Such measures are sometimes obviously beneficial. Styptic and astringent solutions may be injected or applied by means of a camel's-hair brush. Or the surface may be touched from time to time with solid nitrate of silver. As a general rule, however, whatever treatment be adopted the case is likely to prove tedious and troublesome.

In a case detailed by M. Nélaton,* the nostrils were obstructed to such an extent that it was found necessary to remove portions of the bones as well as of the hypertrophied mucous membrane. This was done by means of scissors. The result appears to have been satisfactory, but treatment so severe is very rarely indeed necessary.

Syphilitic Affections of the Mucous Membrane of the Nose.

Various syphilitic affections of the mucous membrane of the nose, with or without ulceration, are often attended by obstinate coryza. Such affections occur commonly during the secondary stages of the malady, and are to be distinguished from those more serious affections which arise during the tertiary stages, and which commence as a rule in the deeper structures. Sometimes, however, in the secondary stages, ulceration, at first comparatively slight and superficial, if unchecked by treatment may penetrate deeply, and involve to some extent the bones or cartilages. In such case the inoffensive coryza may give place to an almost intolerable ozæna. This is especially liable to happen in strumous subjects. Syphilitic coryza commences like a common cold in the head, with increased secretion of mucus, which for a long time remains clear, and of the consistence of thin starch. The discharge is increased by exposure to cold, and by indulgence in alcoholic drinks. If the patient should happen to take cold, the discharge becomes profuse, ropy, opaque, and yellowish or greenish in colour. More or less uneasiness and tenderness are felt in the nostrils, together with a sense of stuffiness or obstruction. The discharge abates at intervals, especially during sleep ; the pituitary membrane feels drier than natural, and crusts of dried mucus are found below the inferior turbinated bone. The patient is frequently inclined to blow his nose to clear it of the excessive secretion, and sometimes traces of blood appear in the handkerchief. On rhinoscopic inspection the mucous membrane is seen to be of a darker or deeper red than natural, and here and there superficially eroded. A similar condition may extend throughout the recesses of the nasal cavities, and into the ethmoidal cells, and the frontal and maxillary sinuses. It may be attended by headache, alteration in the character of the voice, and impairment or abolition of the sense of smell. Sometimes it appears late; and it often obstinately persists long after all other secondary symptoms have subsided.

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* *Clinical Lectures* (American Translation by Atlee), p. 414.

Treatment.—The administration of mercury is requisite, or at any rate more likely to prove speedily efficacious, than any other mode of treatment. In cases of long standing, in which the syphilitic symptoms generally have disappeared, this alone persisting, small doses of the bichloride may be given twice daily in a couple of ounces of distilled water, and persevered in if necessary for two or three months, as recommended by Mr. Ure. Or a single grain of blue pill or grey powder may be given every night for a similar period. In the more recent cases the use of the calomel vapour bath * is especially to be recommended. The inhalation into the nose of the mercurial vapour produces a well marked beneficial effect. Mercurial lotions injected or applied by means of a camel's-hair brush are useful. All crusts and accumulations of secretion should be washed away by syringing, or by the douche. Mild astringent or detergent solutions should be used. Any ulcers or erosions that can be seen, and reached by the aid of the rhinoscope, may be advantageously touched with nitrate of silver, or sulphate of copper.

Syphilitic Coryza in the Infant.

Coryza accompanied by the characteristic snuffling and difficulty in sucking is in a large proportion of cases among the earliest indications of congenital syphilis. In addition to the ordinary constitutional treatment, careful but thorough syringing through the nostrils is especially to be recommended. Weak solutions of chlorate of potash or borax may be advantageously used as washes. When the discharge is cleaned away, it is often a good plan, if practicable, to pencil over the mucous membrane, where it may seem to be fissured or ulcerated, with a weak ointment of nitrate of mercury and oxide of zinc.

If the discharges are not carefully washed away, they not only tend to irritate and empoison the hitherto unaffected parts, but they are liable to become highly offensive. When once the ozænic condition is fully established, the treatment of the case becomes much more difficult and tedious, and the probable ultimate result much more serious. The bones and cartilages even if they escape actual destruction by caries or necrosis, may fail to become fully and perfectly developed, and the nose may consequently present in after life the characteristic appearances of the *nez écrasé*.

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* See Mr. Lee's article on SYPHILIS in the First Volume of this Work.

OZÆNA.

The term 'ozæna,' like 'coryza,' designates a symptom rather than a disease. It implies a fœtid discharge from the nose, which communicates an almost intolerable odour to the breath. The discharge varies in character and quantity in different cases, and under different circumstances. It may be thin and sanious, or thick, tenacious, and semi-purulent; almost colourless, or yellowish, or greenish yellow, or stained with blood; it may be scanty or profuse; sometimes it quickly dries up into thick hard crusts; sometimes the crusts formed are few and thin. But in every case there is the characteristic, though somewhat variable, offensive odour, which often embitters the life of the sufferer by rendering him repulsive to all about him.

Ozæna arises from various causes, and is associated with many different conditions. The treatment requisite varies with the cause of the malady, and the constitutional and local conditions present. It is therefore of the highest importance to form, if possible, an accurate diagnosis, and not to rest satisfied with simply designating as 'ozæna' every offensive discharge from the nostrils. Weber* considers it would be well 'to reject the term altogether, since it serves, as a rule, as a cloak for incomplete diagnosis.' In all cases careful and thorough rhinoscopic examinations should be made from time to time.

Among the common causes of ozæna may be enumerated syphilitic, strumous, and lupous ulcerations of the mucous membrane, with or without caries and necrosis of the bones and cartilages; the presence of foreign bodies; and the retention of fragments of bone that may have become necrotic or carious as the result of injury. There remain, however, a considerable number of cases not assignable to any one of these causes, nor, indeed, to any other cause at present well made out. To such cases the term *idiopathic* or *constitutional ozæna* is applied.

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* In his excellent article on 'Diseases of the Nose' in the *Handbuch der allgemeinen und specialen Chirurgie.* Pitha und Billroth: Erlangen, 1866. Band iii. p. 187.

Ozæna must be carefully distinguished from foulness of breath depending upon carious teeth, ulcers in the mouth, affections of the tonsils, &c. The distinction may generally be made by noticing the effect produced when the mouth and nose are closed alternately. In ozæna the odour is most perceptible when the mouth is closed, and the patient breathes through the nose. The opposite is the case in affections of the mouth, &c. A source of fallacy sometimes arises from the dribbling or falling of the nasal discharge into the pharynx.

Treatment.—The treatment requisite depends obviously upon the cause to which the discharge is attributable, as well as upon the local and constitutional conditions with which it is associated. But certain general principles and methods of treatment are more or less constantly applicable in all cases. These may be advantageously described at once. The more special indications are stated in connection with the descriptions given of the several affections which are liable to be, and very commonly are, accompanied by ozæna.

In all cases, proper constitutional treatment is of very great importance; but it rarely proves of much avail, unless the necessary local treatment is fully carried out.

In the local treatment of ozæna, from whatever cause, the general indications are—first, to remove all possible sources of irritation and obstruction, whether crusts of dried mucus, sequestra of bone, or foreign bodies; secondly, to deodorise the nasal cavities, and to wash away all foul discharges so frequently and thoroughly as to prevent any accumulation taking place; thirdly, to modify the special morbid condition of the parts from which the discharge is derived.

These indications may be generally more or less completely fulfilled,—first, by any needful use of forceps or other surgical instruments; secondly, by washing out the nasal cavities; thirdly, by inhalation of vapours; fourthly, by insufflation of powders.

The nasal cavities may be washed out either by means of a syringe, or by the nasal douche. The syringe should have a long slender nozzle with a bulbous extremity, perforated by a rose of small holes. Such a nozzle, connected with a small hand ball enema or injection syringe, forms a very useful and generally applicable instrument. But in a large proportion of cases, no amount of syringing is so effectual, not to say so easy, as the use of the nasal douche. This method of washing out the cavities of the nose is a practical application of a physiological fact discovered by Professor Weber of Halle.* It was some years ago introduced to the notice of the profession by Dr. Thudichum, to whom every acknowledgment is due.† But at present it appears to be less generally known and adopted than it deserves to be. Its value in some cases can scarcely be exaggerated. Indeed, its introduction may almost be said to have done as much to improve the treatment of certain diseases of the nose, as the posterior rhinoscopy of Czermak has done to aid their diagnosis.

The apparatus needful for the nasal douche consists simply of a cylindrical nozzle of horn, vulcanite, or glass, rounded and perforated at one end, and by the other connected with one extremity of a yard or two of elastic tube, through which a constant stream of liquid can be kept up from some appropriate vessel by hydraulic or atmospheric pressure. The nozzle should be three or four inches in length, and of such calibre at its rounded extremity as to fit accurately in the nostril of the patient who is to use it. The close application of the inner walls of the nostril to the nozzle is a matter of considerable practical importance. It is therefore necessary to have nozzles of different sizes for different cases. The rounded end should be perforated by five or six small holes. The elastic tube should be intercepted by a stopcock at a short distance from the nozzle. The far end of the tube may open into the bottom of the india-rubber bag or glass receptacle on stand, as recommended by Dr. Thudichum; or it may be connected with a piece of metal tube, bent syphon-like, or terminated by an inverted funnel-shaped metal, glass, or earthenware footpiece, which may be sunk in the liquid contained in a jug or any convenient utensil.

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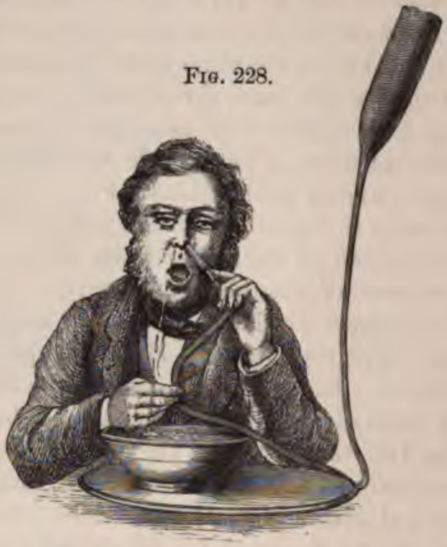
* 'Some years ago it was discovered by Professor Weber of Halle, that when one side of the nasal cavity is entirely filled through one nostril with fluid by hydrostatic pressure, while the patient is breathing through the mouth, the soft palate completely closes the choanæ, and does not permit any fluid to pass into the pharynx, while the fluid easily passes into the other cavity, mostly round and over the posterior edge of the septum narium, and escapes from the other open nostril, after having touched every part of the first half of the cavity of the nose, and a great part—certainly the lower and median canals—of the second half.'—Thudichum, *On Polypus in the Nose and Ozæna*, p. 17. (Churchill, 1869.)

† *Lancet*, November 24, 1864.

The method of using the nasal douche is illustrated by Fig. 228. The receptacle is filled with the liquid to be used, and placed on a level somewhat above that of the head of the patient. The precise height may be varied according to the degree of force with which it is desired that the stream should flow.

The tube is either filled by the simple descent of the fluid, or, if the syphon action is adopted, by pouring a sufficient quantity of fluid into it, and then immersing the footpiece in the jug, &c., or by drawing fluid into the tube after the footpiece has been immersed. The stopcock is then shut off; and the nozzle is inserted well into one nostril of the patient, and held by the corresponding hand. The other hand controls the stopcock. The patient, seated before a basin, and holding his head in its natural erect position or slightly inclined forwards, opens his mouth widely, and breathes through his mouth only. The stopcock is then turned, and a stream of liquid enters the nostril, fills to a certain extent the corresponding nasal cavities, passes round the posterior border of the septum, and finally issues from the other nostril, after having more or less completely washed the nasal cavities on both sides. The force and fulness of the stream may be regulated by the stopcock, and also by varying the height of the receptacle above the head of the patient. The extent to which the cavities are filled depends

Fig. 228.



Method of using the Nasal Douche.

in some degree upon the position of the head. By momentarily compressing the open nostril, the fluid may be made to rise higher than it otherwise would.

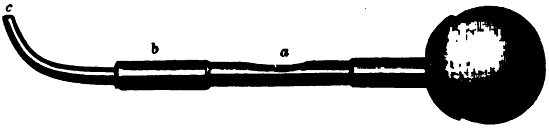
It is sometimes almost astonishing to witness the quantity of crusts and foul discharges that may be thus washed away with the greatest ease, and with no discomfort to the patient. So long as respiration is carried on through the widely-opened mouth, scarcely a drop of fluid escapes into the lower parts of the pharynx. The moment the mouth is closed, the soft palate falls, and all the disagreeable indications of downward flow of fluid occur. The liquids to be used with the nasal douche must be varied from time to time, according to the nature and condition of the case. But in all cases some saline solution should be used, rather than plain water, which is found to irritate the mucous membrane much more than a solution of higher specific gravity. As a general rule, about a teaspoonful of common salt, or of a mixture of equal parts of common salt, and phosphate or carbonate of soda, to a pint of water forms the best ordinary wash. The slight alkalinity of the solutions of phosphate and carbonate of soda helps to soften the crusts. To such solutions as bases, various deodorising, detergent, astringent, or 'alterative' remedies may be added, according to the indications afforded in each particular case.

It is scarcely necessary to add, that this method is not applicable in cases in which the soft palate is destroyed, nor in those in which either side of the nose is absolutely, or even very nearly occluded. In cases in which the septum is extensively perforated the method is useful, but it obviously loses more or less of its full efficacy.

The inhalation of vapours or of 'atomized' fluids is sometimes very useful. If such vapours should be of irritating character, it may be a good plan to direct their passage, and to defend other parts, by inserting into each nostril little hollow cones such as may be readily extemporised by folding round a piece of card or paper.

The insufflation of powders may sometimes be accomplished by their being 'snuffed' up by the patient. But this is a comparatively ineffectual way in any case, and altogether inapplicable if the nasal cavities are obstructed. A far better plan consists in blowing the powder up through a small tube inserted into the nostril. A piece of glass tube properly curved, or even a quill, with a bit of india-rubber tube attached, forms an efficient instrument easily extemporised. The most perfect instrument for the purpose is that which bears the name of Rauchfuss's Insufflator (Fig. 229). The powder is introduced into the tube through the opening (*a*), which is then covered over by the sliding tube (*b*), the extremity (*c*) is introduced into the nasal cavity, and then by a sudden compression of the india-rubber ball (*d*) the powder is driven out, and diffused in all directions.

FIG. 229.



Rauchfuss's Instrument for blowing powders into the Nose.

Syphilitic Ulceration, Caries, and Necrosis.

The comparatively superficial syphilitic affections of the mucous membrane already referred to (p. 271), if unchecked by treatment, may gradually go on until deep and extensive ulceration results, and the bones and cartilages are more or less seriously implicated or destroyed. In such cases the coryza of the earlier stages gives place to ozæna; and sooner or later the general conformation of the nose may be changed. These results occur, as already stated, not only in acquired, but also in congenital syphilis. All cases of long-continued syphilitic coryza, followed, in spiteof treatment, by ozæna, demand the most careful watching and skilful management on the part of the surgeon. In such cases intracranial mischief of the most serious character sometimes supervenes. Numerous examples are given by Dr. Weber in his paper on this subject in the forty-third volume of the *Medico-Chirurgical Transactions.* Occasionally pyæmia is set up.

In a case, mentioned by Dr. Weber, cessation of the sanious ozænic discharge was soon succeeded by head symptoms; four days later the patient was seized with rigors. Other indications of pyæmia came on. Death occurred on the thirteenth day after the first rigor. Post-mortem examination revealed thromboses of the left ophthalmic vein and cavernous sinus, together with purulent meningitis about the under surface of the left cerebral lobe. Secondary abscesses were found in the lungs and liver, and purulent effusion in the left pleura.

The most destructive syphilitic affections of the nose, however, arise, as a rule, during the tertiary stages of the malady, and are most liable to occur in strumous subjects. It would appear that these affections generally commence as gummatous periostitis.* Caries and necrosis of the bones, softening down of the effused material, ulceration of the mucous membrane, and discharge of matter in turn ensue. The discharge is very offensive. The disease advances more or less rapidly, until the vomer, the perpendicular plate of the ethmoid, more or less of the cartilaginous septum, and the turbinated bones, as well as the floor, of the nose and other parts may be destroyed. But it is very rarely, if ever, that the experienced surgeon has the opportunity of tracing from the commencement the progress of the malady. He *sees* the more or less direful results of want of proper treatment, or the effects of mismanagement. He can often only *guess* what may have been the early history of the case. Sometimes the bones are destroyed piecemeal, and numerous small fragments exfoliate one after another. Sometimes considerable portions become at once necrotic. Every pathological museum contains illustrative specimens, and almost every hospital surgeon of experience has met with examples.

The most serious consequences may follow either from extension of the mischief to the interior of the skull, or from some incidental or accidental complication.

Trousseau mentions a case in which a large irregular portion of the ethmoid (at least a fourth part of the whole bone) fell through the posterior nares into the throat and almost caused suffocation. The patient died next day with cerebral symptoms, probably due to extension of inflammation through the cribriform plate.†

But short of such fatal results, the loss of portions even of the bony and cartilaginous parietes of the nose is liable to be followed by permanent deformity, which may be more or less serious. It therefore behoves the surgeon to foresee, and, if possible, to avert by vigorous and judicious treatment the impending dangers.

It was formerly the custom to attribute the ravages of syphilis, in the nasal region especially, to the abuse of mercury rather than to the disease itself. But I believe most surgeons are now agreed in considering such an opinion erroneous. Many cases of syphilitic caries and necrosis, attended by deformity, are on record, and others present themselves from time to time in which there is no evidence whatever that mercury has been administered, but rather the opposite.

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* See the article by O. Weber, in 'Pitha und Billroth,' op. cit. p. 189.

† *Clinique médicale,* tome i. p. 546. Paris, 1868.

Sir Benjamin Brodie mentions a good example. A gentleman had a chancre. No mercury was given. Two years afterwards he had extensive disease of the bones of the nose. Epilepsy, mania, and death ensued. Sir B. Brodie had no doubt but that the disease extended through the cribriform plate of the ethmoid, and ultimately affected the membranes and the brain.* Dr. Graves alludes to two analogous cases in each of which it is worthy of note the strumous diathesis was pre-eminently marked.†

The diagnosis of syphilitic disease of the nose is not as a rule difficult; but sometimes it is necessary to be very cautious in forming an opinion. It must be borne in mind that caries and necrosis of the bones of the nose, accompanied by ozæna, arise from various other causes as well as from syphilis.

The history of the case, the aspect of the patient, the presence of other symptoms, especially of general syphilitic cachexia, the extent of the mischief, &c., afford most important aid in the diagnosis.

Ulcers, periosteal swellings, perforations of the septum, portions of necrosed or carious bone, &c., if present, can often be more or less readily seen on rhinoscopic inspection, or felt on exploring the cavities with the fingers or probe. Sometimes, however, comparatively little can be discovered beyond the ozænic discharges and crusts, and some swelling, with at most superficial erosions of the mucous membrane. But it must not be hastily assumed that neither deep ulceration, nor necrosis, nor caries exists. For the parts affected may be high up in the nose, or concealed from view by the swelling of other parts, or the presence of the discharge. It is probable that in all cases of syphilitic ozæna there is deep ulceration of the mucous membrane, and in a large proportion of cases the bones are more or less seriously implicated. It is easy to understand how a small sequestrum of bone may remain hidden in one of the recesses of the nose, and yet serve to keep up the offensive discharge.

Syphilitic periostitis of the bones of the nose is usually attended by violent racking pain in the nose and forehead. In some cases in which the nasal bones, and nasal processes of the superior maxillary bones are affected, there may be more or less swelling visible externally, accompanied by pain, tension, and tenderness. The local pain is often associated with severe syphilitic headache, and the sufferings of the patient are extreme, especially so when he is warm in bed.

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* *London Medical Gazette*, 1844.

† *Clinical Lectures*, vol. ii. p. 484.

Treatment.—The importance of local treatment can scarcely be exaggerated. But while such treatment is being carried out, it is almost equally important that appropriate constitutional remedies should be administered.

The local treatment essentially consists in the removal of all sources of irritation, as dried crusts of foul mucus, loose fragments of bone, &c., and in washing away the discharges so frequently and thoroughly that they have no time to accumulate and decompose.

Careful inspection and exploration of the nasal cavities should be made from time to time; periosteal abscesses should be opened early by the knife; all loose or carious fragments of bone should be removed by the forceps or other instruments as soon as they are discovered. Ulcers may be touched with nitrate of silver, or sulphate of copper. A long probe, one extremity of which has been dipped into a little fused nitrate of silver, forms the most convenient caustic-holder for this purpose.

The nose should be frequently and thoroughly washed out, either by the nasal douche, or, if the septum is extensively destroyed, by means of a syringe with a long nozzle. Solutions of chlorinated soda, or of permanganate of potash, may be added to the simple saline basis already described (p. 277). Or chlorate and permanganate of potash together, or chlorinated soda and borax, in solution, may be advantageously used. Dr. Thudichum especially recommends the permanganate. In some cases a weak solution of the bichloride of mercury, or the common yellow lotion is of service. After the nose has been thoroughly washed, the immediate inhalation of the vapour of iodine, or the insufflation of Trousseau's mercurial powder,* often proves very beneficial. The inhalation of iodine is most useful in the tertiary stages of the malady, the mercurial insufflation in the secondary stages.

The constitutional treatment must be regulated in accordance with the stage of the malady and the condition of the patient. In the secondary stages, especially if the bones and cartilages are not implicated to any formidable extent, mercurials are indicated. They may be administered either in small doses taken internally,* or by inunction; or the calomel vapour-bath may be employed. The last method has the advantage of conjoining local with general treatment, inasmuch as the patient may inspire some of the vapour into the nose. This treatment must be very carefully watched.

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* Red or white Precipitate, 1 part; finely-powdered Sugar, 60 parts. Op. cit. p. 547.

In the tertiary stages, in which the affection has commenced as a periostitis, and especially if the bones and cartilages are extensively destroyed, or if mercurials have already been administered at an earlier period, iodide of potassium is indicated, and mercurials are likely to prove prejudicial. The iodide of potassium should be given in full doses (g. xx. to g. xxx. or even more) three or four times a day. It may be conjoined with iodide of iron and cod-liver oil. These remedies are particularly valuable in cases in which there is pronounced cachexia and great loss of strength. Other tonics, as dilute nitric acid, quinine, &c., may often be advantageously given.

Lupous and Strumous Ulceration, &c., accompanied by Ozæna.

Lupus, as already stated (p. 239) may first attack the mucous membrane of the nose. In this case the diagnosis is not always so easy as when the skin is primarily affected.

Lupus exedens commencing in the mucous membrane corresponds very closely to the affection that has been described by Mr. Ure† and other authors as '*erosive ulcer of the follicles.*' The earlier symptoms resemble those of a simple catarrhal affection of the pituitary membrane. The mucous membrane covering the cartilaginous septum usually suffers first. The patient experiences a certain degree of tenderness and sense of fulness, especially after exposure to cold air; and a constant inclination to blow the nose, or to pick away the crusts which are constantly reproduced. Small red angry-looking tubercles can be seen on inspection, and these sooner or later give place to spreading ulceration. But the ulcers preserve to some extent their tubercular character, and the apices of the tubercles are concealed by dry, hard, tenacious crusts. As the ulceration proceeds, the cartilage suffers, and the septum soon becomes perforated, especially if the mucous membrane has been affected simultaneously on both sides. By further extension one ala or both may be destroyed, and the bones may be implicated. Still later, very serious deformity may ensue from the falling in of the bridge of the nose, or from extension of the disease to the external parts. The discharges vary in offensiveness in different cases, and at different periods.

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* See p. 272.

† See First Edition of this Work, vol. iii. p. 194.

It is of the highest importance to distinguish affections of this kind from those that are of syphilitic origin. If such distinction is not made, very unjust suspicions may attach to the character of the patient; and the surgeon may be induced to adopt a line of treatment which may prove positively injurious. In making the diagnosis, attention must be directed to the history of the case, the age of the patient, the absence of other symptoms of syphilis, and especially the absence of the characteristic cachexia which almost always accompanies the more serious syphilitic affections of the nose, and also to the comparative slowness with which the malady has progressed, and the lateness of the period at which the bones have become affected. The presumptive evidence thus acquired as to the nature of the case receives ample confirmation if the little papillary infiltrations of lupus can be recognised, and the tubercles present a compact granulous appearance; and still further if the disease progresses very slowly, and there is a manifest disposition to healing here and there, even while the ulceration is extending.

The treatment of lupus has been already fully discussed (p. 243). It may be added, however, that the actual cautery in the form of the galvano-caustic pencil, or platinum wire, or the red-hot iron, is especially well adapted for the destruction of lupus within the nose. Caustic potash and chloride of zinc are not so readily controlled. From their deliquescence they are apt to run over the healthy parts. Solid nitrate of silver, thoroughly and repeatedly rubbed in, is sometimes efficacious. Mr. Ure recommends the application of a thin layer of a paste composed of one part of chloride of zinc with two or three parts of gypsum or powdered tragacanth, with a little alcohol. Sometimes after the ulcers are healed, a sense of rawness or tenderness of the pituitary membrane remains, depending upon chronic inflammation. In such cases, mild astringent washes are useful; and the nostrils may be advantageously plugged with loose dossils of cotton wool, so as to obviate irritation from the passage of cold air.

Ozæna, associated with Ulceration, Caries, and Necrosis from other causes.

Simple catarrhal ulcerations of the mucous membrane are usually only superficial erosions, and are rarely accompanied by ozæna. In some cases, however, they precede, or are associated with, the so-called idiopathic ozæna described in the next section.

As a rule they heal speedily under simple treatment, when they are not irritated by 'picking' on the part of the patient, or undue interference on the part of the surgeon.

Ulceration of the mucous membrane, with more or less extensive destruction of the cartilages and bones, sometimes occurs among the sequelæ of severe fevers—as scarlet fever, measles, smallpox, typhus, and, more rarely perhaps, erysipelas and chronic pyæmia. The affection may begin during the height of the fever with swelling of the mucous membrane, accompanied by pain in the part affected and in the forehead, and headache. There is often œdematous swelling of the lower part of the nose and upper lip. Subsequently abscesses may form, and the cartilages and bones may become implicated, and perforation of the septum may result. The perforation is generally more or less circular, and has but little disposition to extend.

Injuries followed by necrosis, abscess, and the retention of sequestra of bone, are not uncommon causes of ozæna.

Foreign bodies retained in the nasal cavities are very liable to cause ulceration, caries, and necrosis, and to give rise to distressing and obstinate ozæna. In such cases the presence of the foreign body is often unsuspected, and only discovered after a long period of suffering on the part of the patient.* The necessity for careful examination, and the treatment required, are sufficiently obvious.

Idiopathic or Constitutional Ozæna.

There remain certain cases, and these not a few, in which, even after the most careful and repeated inquiries and examinations, the surgeon may utterly fail to discover any obvious cause of the horribly offensive discharge from the nose which renders the patient's life miserable, and his society almost unendurable. Neither caries nor necrosis of the bones can be made out, nor even ulceration of the mucous membrane, or at most only superficial excoriation. But the mucous membrane generally appears unnaturally and irregularly reddened, and often attenuated and atrophied in some parts and swollen in others. The odour of the discharge is altogether indescribable, but it cannot be mistaken.* The discharge varies in abundance, and the crusts which are formed vary in thickness and dryness. The discharge often becomes worse in young women during the menstrual periods.

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* A very remarkable illustration is afforded by a case detailed by Dr. W. Hickman, in which a steel ring was removed from the posterior nares of a girl sixteen years of age, after having been lodged there for more than thirteen years, during which period it had occasioned horrible ozæna and other severe symptoms.—*British Medical Journal*, Sept. 28, 1867.

It has been suggested in explanation of this form of ozæna that there may exist some anomalous condition of the secretions which renders them liable to undergo a peculiar process of decomposition, and that such condition depends upon some unexplained constitutional cause. It has also been suggested that the offensiveness of the discharge from the nose may be considered analogous to the somewhat similar offensiveness of the perspiration of the feet, axillæ, &c., not unfrequently met with in persons who are nevertheless scrupulously cleanly in their habits. It seems to me not improbable that, at any rate in some cases, the affection may really be the result of a form of lupus nonexedens implicating chiefly the mucous membrane of the upper and back parts of the nasal cavities. The age at which the affection commonly commences, the constitutional diathesis with which it is associated, the comparatively slight detriment to the general health, its obstinate persistence, the appearance of the mucous membrane, its wasting, and the destruction of the sensitive papillary layer as evidenced by the loss of smell, and lastly the beneficial effects of the same remedies that are useful in lupus nonexedens, all seem to indicate the existence of some close relationship between the two maladies.

Idiopathic ozæna sometimes commences during childhood, and in spite of treatment continues until after the middle period of life. When it has continued long, more or less alteration in the contour of the nose is sometimes observed: thus there may be more or less dilatation of the nostrils, and some flattening of the bridge of the nose. The sense of smell is permanently impaired, and sometimes altogether lost.

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* The French name 'Punaisie' is suggestive, but it fails to convey a full idea of the character of the stench.

Treatment.—In the treatment of this form of ozæna the nasal douche is especially valuable. The solution used may be varied from time to time; in some cases one solution, in others a different solution answers best. Solutions of permanganate of potash, chlorinated soda, carbolic acid, &c., may be used to deodorise and cleanse away the discharges, and solutions of nitrate of silver, or bichloride of mercury, or sulphate of copper, or the ordinary mercurial lotions, may be used as so-called 'alteratives;' and alum, sulphate of zinc, tannic acid, &c., as astringents. The strength of the solution must be varied according to the effects produced. Care must be taken that poisonous solutions are not swallowed. It is well to begin with weak solutions, and gradually increase their strength. The smarting produced should not continue for more than a minute or two after the washing has ceased. If it does, too strong a solution has been employed; or the specific gravity of the solution has not been properly regulated by the addition of the common salt or phosphate of soda. After the crusts and discharges have been washed away, iodine vapour may be advantageously inhaled for a few minutes. A little tincture of iodine may be added to hot water and the vapour inhaled; or the patient may 'smell' a portion of solid iodine, or a sponge moistened with the tincture, contained in a small glass or wooden box perforated above and below. Chlorine and bromine inhalations may also be recommended.

In the treatment of this form of ozæna, Trousseau speaks most favourably of the insufflation of various powders. Among those most generally applicable are the subnitrate of bismuth combined with an equal proportion of talc; chlorate of potass by itself, or with seven or eight parts of sugar; borax, similarly diluted; the mercurial powders already alluded to; calomel, with twenty to thirty parts of talc, &c. The effects of the insufflation of the mercurial powders should be very carefully watched, and the insufflation should not be too frequently repeated. Two or three times a day is generally often enough. But the other powders may be used much more frequently, almost ad libitum. In all cases it is important to wash out the nose thoroughly before blowing in the powders. It not unfrequently happens that the thorough cleansing of the cavities, and subsequent insufflation of the powder, is followed by immediate abolition of the foul odour,—for the odour belongs to the discharge. But such abolition as a rule is only temporary. When the discharge collects again, the odour returns. In some cases the application of solid nitrate of silver to the various parts of the mucous membrane, so far as practicable, does good, although at the time it occasions much pain and lachrymation.

Wetzler[*] recommends the application of creosote ointment, (ʒj. to ℥j. cerate) to the mucous membrane by means of a camel's-hair brush.

The special local treatment must be varied from time to time according to the indications that arise. Sometimes one application, sometimes another, seems to do most good. It is necessary to persevere for some time even after the discharge has ceased, or at any rate has lost to some extent its foulness. Relapses are very common; and the patient is too often apt to be encouraged by temporary improvement to discontinue the treatment, before the condition of the mucous membrane is so far modified as to render probable the permanence of the cure. The greatest patience is requisite in the management of these cases; and the most careful examination should be made from time to time, for it sometimes happens that some definite local origin may be discovered, although the case has been long considered to have depended upon constitutional causes.

Cod-liver oil, iodide of iron, iodide of ammonium in small doses, and sometimes arsenical preparations, are the internal remedies which have seemed to be most useful.

Glandular Hypertrophy of the Mucous Membrane.

Attention has recently been directed to a class of cases in which there is more or less swelling or thickening of the naso-pharyngeal and naso-palatine mucous membrane, associated with enlargement of the various glandular structures belonging to it.

In one group of cases[†] the racemose and compound follicular glands appear to be especially affected. These glands are most numerous about the posterior nares, round the openings of the Eustachian tubes, and in the roof of the pharynx under the petrosal bone. When they become morbidly affected, an excessive quantity of viscid mucus is secreted. At a later period pus-like fluid may be discharged. Still later the mucous or purulent secretion, if retained for some time, may become converted 'into little fœtid cheesy masses, which are from time to time extruded through the nose or mouth.' Accompanying these conditions the mucous membrane generally is more or less irregularly swollen. The ordinary symptoms are, 'discomfort, aching, or pain in the neighbourhood of the soft palate and posterior nares; tingling or sense of fulness about the root of the nose; frontal headache; a thick mucous, purulent, or cheesy secretion discharged at intervals, chiefly through the mouth, by means of snorting nasal inspirations, followed by hawking; slight perversions of taste and smell; alterations of voice; sometimes temporary deafness from obstruction of one or both Eustachian tubes, and an abundant secretion of wax in the external ear.'* In all cases presenting such symptoms, rhinoscopic inspection and digital exploration should be made.

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[*] See Weber, in 'Pitha und Billroth,' op. cit.

[†] See Dr. Andrew Clark, 'On Naso-palatine Gland Disease,' *London Hospital Reports*, vol. i. p. 211.

The treatment is often tedious and sometimes unsatisfactory. The nasal douche is especially applicable in these cases. Mild astringent solutions are indicated. In some cases I have seen excellent results follow the application of a mixture of tincture of the perchloride of iron and honey (one part of the former to two of the latter), by means of a camel's-hair brush to the surface of the naso-pharyngeal mucous membrane. In other cases a strong solution of nitrate of silver similarly applied, as recommended by Dr. A. Clark, has proved useful.

Attention should be directed to the general health, especially to the condition of the digestive organs, which are frequently disordered in these cases. Purgatives followed by tonics, are generally indicated, and sometimes cod-liver oil and steel.

In another group of cases, especially described by Dr. Wilhelm Meyer of Copenhagen,† exuberant growths or vegetations are met with in certain parts of the naso-pharyngeal cavity. 'These vegetations, when examined microscopically, are found to consist of the so-called 'adenoid tissue,' and are accordingly to be regarded as overgrowths or morbid growths of the closed glandular structures found in or beneath the mucous membrane of the pharynx, the fauces, and the base of the tongue. They vary in form and consistency: sometimes they are solid and firm, and at others soft and highly vascular, and prone to bleed.

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* Dr. A. Clark, op. cit.

† *Proceedings of the Royal Med.-Chir. Soc.*, October 18, 1869. 'On Adenoid Vegetations in the Naso-pharyngeal Cavity,' by Wilhelm Meyer, M.D., of Copenhagen. Communicated by John Marshall, F.R.S.

The presence of these vegetations in any considerable quantity impedes respiration through the nose, and gives a peculiar 'nasal' character to the voice. There is often some degree of deafness. 'The nostrils are flattened so that the nose appears compressed.' There is deficient secretion from the nostrils, and sometimes blood accumulates in the mouth. Digital examination and rhinoscopic inspection demonstrate the presence of the outgrowths. They are most frequently met with in underfed young people. The treatment consists in removing the vegetations by the knife, or by the galvanic cautery, or by repeated applications of nitrate of silver. Dr. Meyer recommends the use of 'a ring-shaped knife, mounted on a long slender handle, which is passed through one or other nostril, and manœuvred so as to sweep over the mucous surface affected. The bleeding is free, but not excessive.' Two or more operations are sometimes necessary. According to Dr. Meyer, the results of this proceeding, supplemented by the use of the nasal douche, have proved very satisfactory.

AFFECTIONS OF THE SEPTUM.

Besides the deviations and deformities already alluded to (p. 255) the septum is liable to various affections, which from their practical importance merit more special description than has been given in the preceding pages.

These affections for the most part present themselves as swellings or tumours, possessing different characters; some contain blood, others pus, others a gelatinous fluid, and others again have a somewhat cartilaginous consistence.

Blood tumours of the septum are always the result of injury, and generally are formed within a few hours of the accident. The swelling usually occupies both sides of the septum, but it may be confined to one side. In some cases the mucous membrane only presents a flattened elevation, appearing as if raised by uniform effusion beneath it; in others it is more or less distended. There is often a good deal of tension and surrounding hardness, which render the detection of fluid difficult. The swelling may generally be seen by aid of the speculum, or by simply pressing up the tip of the nose, and so dilating the nares. It is generally of dark purple colour, and smooth and glossy in appearance. Its base is broad, with more or less abrupt limits. The symptoms are a sense of fulness and stuffing of the nose, with impediment to free respiration proportioned to the extent of the effusion.

Treatment.—The indications are to prevent if possible inflammation and suppuration, and to favour absorption. The application of cold externally, by means either of the small ice-bag, or evaporating lotions, may often prove useful. Incisions are rarely necessary. Jarjavay cites an instance of loosening of the pituitary membrane of the septum caused by effused blood after a bruise. The swelling completely misplaced the cavity of the nose on each side of the septum, and the patient could breathe only by the mouth. An incision was made into the swelling; dark liquid blood was discharged, and a breach of continuity in the septum was detected with a probe.

Abscess of the septum.—Abscess of the septum may result from injury. It is more likely to do so in the case of a scrofulous subject, or in one suffering from fever.* It often occurs when the integument is wounded near the lower edge of the nasal bones. In such case the integument of the nose becomes œdematous and tender on pressure; the pituitary membrane is inflamed, and the portion covering the septum is uniformly turgid; the secretion of mucus is diminished; and there is more or less febrile disturbance. At a later period matter is formed beneath the mucous membrane; and a prominent swelling, causing proportionate obstruction, appears in one nostril or both. The inflammation may spread to the frontal sinuses and lachrymal passages; and headache and epiphora may result. Sometimes the lower margin of the septum, and the upper lip become affected. The swelling itself is red, shining, tender on pressure, and its base is extensive; fluctuation can be distinctly detected, and sometimes is communicated from one side to the other through the septum.

In the *treatment* of such cases it is important to prevent the formation of matter if possible, and if not, to give it free exit by incision as soon as it is formed. In making the incision the thickened state of the mucous membrane must be borne in mind, and care must be taken to prevent the too early closure of the opening made. The discharge is generally of a thin sero-purulent nature at first, but bye and bye assumes a glairy consistency. Soothing, and subsequently astringent washes and injections are useful in restoring the mucous membrane to its normal condition.

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* See Mr. Fleming's able Article in the *Dublin Journal of Med. Sc.* vol. iv. pp. 16–28.

Chronic abscess of the septum sometimes commences without any assignable cause, and progresses very insidiously. The inflammatory stage is sometimes so faint as to pass unheeded; and the patient is not aware that anything is the matter till the abscess is fully formed; and then suffers not so much from actual pain, as from uneasiness felt in the nares. In these cases the outer surface of the nose is never involved. In this form of abscess there is less redness, tension, and tenderness on pressure than in the acute form. The abscess, besides, is more extensive, and more likely to occur singly on either side of the septum. It may communicate with a collection of fluid situate outside the nose—in the upper lip, for example. The matter secreted has sometimes a highly offensive smell.

The swellings formed by such abscesses may possibly be mistaken for polypi, unless care is taken in the diagnosis. They are still more likely perhaps to be confounded with the thickened elongated condition sometimes presented by the mucous membrane of the septum.

These abscesses should be opened early; and in some cases benefit will be derived from injecting a weak solution of nitrate of silver or some detergent solution into the cavity. Every care must be taken to prevent extension of the disease, and to obtain a cure without any permanent deformity. A guarded prognosis should always be given in these, as in other affections of the septum; for there is always danger of the destruction of the bones or cartilages, or both; and this may take place long after the apparent cure of the malady. In the majority of cases, perforation, with more or less extensive destruction of the cartilaginous septum, may be expected. Mr. Fleming states that this may be effected by interstitial absorption without ulceration of the mucous membrane, in which case the mucous membrane of one nostril adheres to the other; or ulceration may arise, and then an opening of variable extent admits of communication between them.

When a small permanent opening remains through the septum, a very disagreeable whistling is sometimes produced when the patient speaks. In one case under my cognisance in which this gave rise to great annoyance, the small opening was enlarged by incision. The result was very satisfactory.

NEW GROWTHS. POLYPI.

Abnormal growths of various kinds are not infrequently met with in the nasal cavities. Many of them are commonly termed *polypi.* But it would probably be better to use this term in a somewhat more restricted sense than is at present customary. Some of these growths are benign in character, others are malignant, others again are of doubtful malignancy. They are specifically named, according to their nature and situation, and for the most part may be classified as follows:—First, Papillary Growths. Secondly, Mucous, Gelatinous, or Vesicular Polypi. Thirdly, Fibrous Polypi growing from the lateral walls of the nasal cavities. Fourthly, Naso-pharyngeal Polypi—also fibrous, but growing from the base of the skull. Fifthly, Cartilaginous and Osseous Growths. Sixthly, Malignant Growths.

Papillary Growths.

Cases occasionally, though rarely, occur in which the nostrils are obstructed, or more or less completely blocked up by papillary growths springing from the mucous membrane. Such growths bear a general resemblance to the papillomata of the mucous membranes of other parts, but so far as I have seen, the individual papillæ are acuminated. They are usually, if not invariably met with in children or young people; and as a rule, they spring from those portions only of the mucous membrane which line the cartilages. They may be present in one nostril or in both. They are accompanied by some discharge or running from the nose, and give rise to a variable degree of irritation, and disposition to pick the nose. Respiration is obstructed, and the voice affected to an extent proportionate to their development. Their presence may be readily recognised on inspection.

Such growths may be easily and effectually removed by means of scissors, forceps, the wire snare, or the galvanic cautery. After they have been removed, the affected nostril should be carefully cleansed by syringing until all discharge has ceased.

Two cases of this kind have recently come under my observation. Another is mentioned by Mr. Bryant,[*] and the particulars of several more have come to my knowledge. In all the treatment has been successful, and in none, so far as I know, has there been any recurrence of the growths.

Mucous, Gelatinous, or Vesicular Polypi.

These so called 'polypi,' are by far the most common of all the abnormal growths met with in the nasal cavities. They may be regarded as localised hypertrophies, or outgrowths of the mucous membrane, and submucous tissue. They are soft, pulpy, and somewhat elastic in consistence; pale, yellowish, greyish, or slightly greenish in colour; and shining and semi-translucent in appearance. They are, as a rule, pedunculated and pendulous, and may be more or less easily moved by the finger or a probe. Sometimes they are moved to some extent to and fro during respiration, or they may be so moved by forcible respiratory efforts. In some cases they occur singly, in others they are multiple. Sometimes they are uniform in contour, and more or less pear-shaped. Sometimes they are irregularly lobulated, and fit themselves to the cavities in which they lie. When incised, and submitted to pressure, they give out a variable quantity of sero-albuminous or synovia-like fluid. Superficially, they are often seen to be traversed by a few fine blood-vessels.

Microscopical examination shows that these polypi are related to the 'myxomatous' tumours of Virchow, among which, indeed, they are sometimes included. They consist of extensions of the mucous membrane, including more or less closely reticulated fibro-cellular structure, which is continuous with the normal submucous tissue. Their surface is covered by ciliated epithelium; and their substance is made up of delicate, wavy, interlacing filaments, the interstices of which are occupied by fluid, or semifluid material, containing round, oval, elongated, or caudate cells with nuclei, and very fine granules or molecules. The normal mucous glands, according to Billroth,[†] are enlarged and converted into clustering formations with very numerous sacculi, and these help to make up the mass. In some cases these sacculi become cystic in appearance, and the 'vesicular' character of the polypi is pronounced. In other cases the connective tissue elements are developed in larger proportion; and the growths are consequently firmer and denser, and approach in character the fibrous or sarcomatous polypi. Occasionally the softer polypi become comparatively condensed and opaque in places; and in some rare instances concretions of fibro-cartilaginous hardness are found in them.*

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[*] *Lancet*, August 1867, p. 225.

[†] See Weber, in 'Pitha und Billroth,' op. cit. p. 203. Billroth, *Ueber den Bau der Schleimpolypen.* Berlin, 1855.

These polypi are most frequently connected with those portions of the mucous membrane which cover the superior and middle turbinated bones, and line the superior and middle meatuses. Sometimes they arise in the lower meatus, or are attached to the inferior turbinated bone; sometimes they spring from the roof of the nose; occasionally they grow from the ethmoidal cells, or even from the frontal sinuses into the nasal cavities. But they very rarely, if ever, spring from the mucous membrane covering the septum.† The relation which they may bear to the so-called adenoid vegetations growing from the naso-palatine mucous membrane or floor of the nose,‡ is by no means clearly made out; but it is by no means improbable that some such relationship exists. Both forms of growth appear to depend upon, or at any rate to be associated with distension of the mucous follicles. It is not improbable that the serous infiltration, and somewhat dropsical appearance of the pendulous mucous polypi, as well as the elongation and slenderness of their pedicles, may be due to some extent to the fact that they grow from above downwards. On the other hand the broad bases, and comparative freedom from infiltration of the sessile growths from the floor of the nose, accord with their situation and the direction in which they have to grow. Thus the effects of gravitation may help to explain in some degree the more obvious differences presented by these two forms of growth. Other differences may depend upon the special characters of the mucous follicles in different parts of the nasal cavities. It is worthy of note that the 'adenoid vegetations' and sessile growths of the floor of the nose, most commonly occur in strumous children, while the mucous polypi of the upper cavities are most frequently met with in adults, although they may commence at a comparatively early age.*

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* See case referred to by Gross, op. cit. vol. ii. p. 338.

† I have not been able to find a single satisfactory example on record.

‡ See p. 288.

In cases in which there are several distinct polypi, the lowest or most anterior, having the open nostril before them, make their way downwards uncompressed; but the others are kept up and hidden from sight, and become more or less compressed and hindered in their growth. The polypi, if uninterfered with, go on gradually increasing in size until they more or less completely fill up the nasal fossæ. Sometimes they have an especial tendency forwards, sometimes backwards; sometimes they hang down behind the uvula into the pharynx; sometimes they project forwards and expand the alar cartilages, and even, in rare instances, the nasal processes of the superior maxillary bones.† It is very seldom, however, that any of the bones are seriously affected, but they may sometimes be deprived of their investing membrane, and necrosis may consequently ensue. In the case of a lady, thirty-eight years of age, who had suffered from mucous polypus for many years, Mr. Ure ‡ found 'the internal osseous structure quite denuded.' The patient was eventually cured, after extirpation of the growths.

The earliest symptoms of mucous polypus in the nose are a sense of fulness and weight in and about the nostril affected; frequent sneezing; and more or less mucous discharge. For a long time before the growth becomes visible, the patient seems to be always 'catching cold.' As the growth increases, other symptoms supervene: respiration through the nose becomes more and more embarrassed; the patient suffers from 'stuffiness' and general discomfort; he cannot blow through the affected nostril, or the air passes with a whistling noise; he is obliged to keep his mouth constantly open; during sleep he lies with his head thrown back, and often snores; the voice is more or less affected, and becomes thick, indistinct, and 'nasal' in character; the sense of smell is impaired, or altogether abolished; the sense of taste is affected in so far as it is dependent upon a perfect condition of the olfactory organs; deafness sometimes occurs, either from obstruction to the Eustachian tubes, or from coexistent thickening of the lining membrane of the tympanum; there is more or less constant flow of thin or thick mucous discharge, and the patient is unable to 'blow his nose' satisfactorily. The discharge is rarely offensive. Occasionally there is epistaxis, but not often. It is far otherwise in the case of fibrous polypi and malignant growths. Sometimes the lower orifice of the nasal duct becomes obstructed, and there is overflow of tears. These various symptoms become aggravated in damp, and somewhat alleviated in dry weather; for the polypi are 'hygrometric' in character, and are notably affected by the state of the atmosphere. In dry, warm weather they contract; and in moist or wet weather they enlarge, and become fuller, and paler in colour. Sudden atmospheric changes are liable to give rise to severe fits of sneezing.

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* See Weber, in 'Pitha und Billroth,' op. cit.

† Weber, op. cit.

‡ Former Edition of this Work, vol. iii. p. 212.

The patient is often conscious of the presence of some fleshy substance, and makes frequent but ineffectual efforts to dislodge it, by blowing his nose, or introducing his fingers.

The symptoms thus detailed, indicate the probable existence of mucous polypi. Inspection, conducted in the manner already described,* generally reveals their presence, and digital exploration may aid the diagnosis. When a good light is thrown into the well-dilated nostril, the growth or growths may, as a rule, be readily recognised, and a probe may be passed round the lower parts and carried upwards to some height on either side. Sometimes the growths come more into view after the patient has attempted to blow forcibly through the affected nostril; or they may be pushed into more favourable position by introducing the finger round the free margin of the soft palate into the posterior nares. *Posterior rhinoscopy* is sometimes necessary, or at any rate desirable.

When the polypi can be thus seen and felt, the diagnosis is sufficiently easy. But in the earlier stages it is often difficult and sometimes impossible to get a view of the growths, or to reach them with the fingers. Under such circumstances the case, if it should come under the observation of the surgeon, may for some time be supposed to be one of chronic catarrh, and the discharge to be a simple coryza. In the more advanced stages no such difficulty is likely to exist, if only a careful examination is made. It is well, however, to bear in mind that hypertrophy of the mucous membrane of the inferior turbinated bone, displacement of the septum, abscess of the septum, and foreign bodies, have all been mistaken for mucous polypi, and grievous errors in treatment have resulted.

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* See RHINOSCOPY, p. 256 et seq.

I have recently had under my care a gentleman who had been treated for 'ozæna' for two years. Both sides of his nose were stuffed full of polypi. Another case has come to my knowledge, in which a great part of the inferior turbinated bone was removed in mistake for a polypus. Mr. Ure mentions a case in which 'an inexperienced practitioner, believing he had to do with a polypus in a young lady, tore away a portion of the membrane (covering the septum), and laid bare the bone.'

It is not always easy, however, to ascertain the exact attachment of the polypus, nor to make out at first whether the growth is single or multiple. But these are points of little practical importance. It may sometimes be difficult, but it is always important, to distinguish the benign mucous polypus from other growths of more serious nature. The light colour, semi-translucency, and soft elasticity of the mucous polypus, its slow progress, the absence of frequent hæmorrhages, and the general good health of the patient, serve to distinguish this growth from the fibrous polypus, which is more or less red in colour, opaque, and resistant, and which usually increases rapidly, undergoes no change of volume with change of weather, and is usually accompanied by frequent epistaxis. Malignant growths may be distinguished by their colour, opacity, consistence, and fixity, as well as by their proneness to bleed when touched, and by the comparative foulness of the discharge to which they give rise. Osseous and cartilaginous growths are distinguished by their hardness, fixity, origin, and mode of growth.

Mucous polypi are always very troublesome, but rarely lead to serious results. Now and then they subside, and a spontaneous cure is effected. But it is never worth while to await such a result; for the growths may almost always be removed without much pain, and with scarcely any risk. They are, however, very liable to grow again, especially if any portions are left unremoved, or the patient is unwilling to persevere in the necessary course of treatment.

Treatment.—The only treatment that can be recommended essentially consists in the removal of the growths by operation as completely as possible.

Attempts have been made from time to time to obviate the necessity for operative measures by the use of various escharotic, astringent, and exsiccative applications. But the general results of such attempts have not hitherto been satisfactory, although doubtless, in some instances much good has been effected. Alum, calomel, oxysulphuret of antimony with sugar, cinchona bark, and many other substances in powder, have been used as snuffs, and different astringent solutions have been injected from time immemorial. 'At one time,' according to Professor Gross, 'a good deal of reliance was placed upon the use of finely pulverised blood-root as a snuff; and in 1859, Dr. J. H. Reeder of Illinois published the particulars of two cases in which prompt cures were obtained by strong injections of the tincture of perchloride of iron, aided by the application of a piece of sponge moistened with a solution of this article to the cavity of the nose.'* Mr. Erichsen refers to a case in which 'after the assiduous use of chloride of zinc injections, a very copious discharge of large sloughy polypoid masses took place from one nostril, which had been blocked up for many months previously.'† Nélaton recommends in some cases the repeated application of solid nitrate of silver.‡ Mr. Bryant has recently advocated the insufflation of tannic acid in powder.§ The use of bichromate of potash in a similar manner has been suggested, on the ground probably of the special influence which this salt is believed to exert on the nasal mucous membrane.|| Cases illustrative of its good effects have been published, but at present it has not been extensively tried.

Various methods have been devised for the removal of nasal polypi by operation. In judging which it is best to adopt, the peculiarities of the case under treatment must be taken into consideration. It is always desirable, however, that the surgeon should obtain as good a view as possible of the parts upon which he is operating. The patient must therefore be placed in proper position opposite a good light, or arrangements must

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* Op. cit. vol. ii. p. 340. † *Science and Art of Surgery*, vol. ii. p. 287.

‡ *Pathologie chirurgicale*, tome ii. p. 679.

§ *Lancet*, Feb. 1867, p. 235.

|| According to MM. Becourt and Chevallier, workmen employed in the manufacture of bichromate of potash suffer in a remarkable manner from the effects of the small particles of the salt which they are liable to inhale. The mucous membrane of the nose is seriously affected. Excessive irritation, coryza, and sternutation, are the earliest symptoms. The mucous membrane becomes thinned; detached portions of it come away; after six or eight days the bony septum itself becomes thin, and at last is gradually destroyed.—*Annales d'Hygiène*, July, 1863, p. 83; quoted in *Sydenham Society's Year Book*, 1863, p. 457.

be made in accordance with the directions already given for rhinoscopy. The reflector and speculum afford invaluable aid during the operation. Chloroform is rarely necessary; and if not necessary its administration is undesirable, because by it the patient is rendered unable to assist the surgeon by blowing the polypi downwards and forwards, and clearing the passages from blood. There is, moreover, a possible risk of blood passing into the windpipe.

The method at present most commonly adopted consists in the avulsion of the growths by means of forceps. The forceps should be about seven or eight inches in length, and strong, but as slender as may be consistent with strength. The ordinary forceps are too thick. The blades should be grooved longitudinally, and well serrated along their edges. They may be curved or straight. Curved forceps are required when the polypi are situated far back, and have to be removed through the mouth. In most cases in which it is intended to remove the growths through the nostrils, straight or nearly straight forceps are best. The patient should be seated on a rather high chair; his head should be thrown well back, and supported by an assistant, who at the same time may advantageously elevate the tip of the nose, and hold the speculum by which the nostril is dilated. The elevation of the tip of the nose is especially desirable in cases in which it is requisite to introduce a straight instrument into the lower meatus, for as already hinted, the external opening of the nostril is on a somewhat lower level than the floor of the nasal cavity. The closed blades of the forceps are introduced into the nose, and made to glide along the floor or septum until their extremities have reached, and passed to some extent the visible portion of the polypus. The blades are then opened in a vertical or oblique direction, and turned upwards and outwards, so as to include between them as much as possible of the growth. The growth is seized and held as tightly as possible, and is finally torn from its attachment, and removed from the nose by steady traction, and rotation of the forceps on their long axis. It is better as far as possible to twist the polypus off, as it were, rather than to drag it straight away at once.

Sometimes the polypus yields, and is pulled out of the nostril without being detached from the general mucous membrane. In such case, it must be grasped close to its root by means of a second pair of forceps, and twisted and pulled until its entire avulsion is accomplished; or its pedicle, if within reach, may be divided by scissors or a bistoury.

When the polypus is situated far back and hangs down into the pharynx, it may sometimes be seized and removed by means of properly curved forceps introduced through the mouth. There is often, however, great difficulty in keeping the tongue down, and in resisting the spasmodic retching which is apt to be excited by the presence of the instrument. Moreover, it is not always easy to avoid including the mucous membrane of the uvula or soft palate between the blades of the forceps. The better plan, therefore, would seem to be, as suggested by Mr. Syme,* to detach the polypus by means of forceps introduced through the nostril, and then to push it on into the throat. In some cases, advantage may be derived from the use of forceps so constructed that the blades can be introduced separately, and afterwards locked together, after the manner of midwifery forceps.†

It is scarcely necessary to add that very great care must be exercised in applying the forceps and removing the growths. Otherwise, there is considerable risk of inflicting more or less serious damage. Many instances have occurred in which one or other of the turbinated bones, as well as large portions of mucous membrane and periosteum, have been ruthlessly torn away.

But although the method of extraction by forceps thus described is recommended by most surgical writers, and very generally adopted, I believe it is far inferior, in many respects, to the method of extraction by the 'wire snare' devised by Mr. Hilton. This method has been for many years past constantly and successfully practised at Guy's Hospital, to the almost entire exclusion of the use of the forceps. But it does not appear to be so widely known as it deserves to be. In our experience it has proved more easy and effectual, and less painful and less likely to prove mischievous, than other methods commonly adopted.

The instrument employed is figured on the next page (Fig. 230). The thumb of the surgeon is passed into the ring *a*; his middle and forefinger hold the cross-piece *b*, and slide it backwards and forwards along the quadrangular stem *c*. The nasal portion *d* of the instrument is cylindrical, slender, and tapering. It is connected with the quadrangular portion *c*, by means of a hinge joint *e*, so that it may be bent at such an angle as to enable the hand of the operator to be kept from obstructing the view. Its slightly bulbous extremity *f* is doubly perforated in a longitudinal direction for the passage of the wire. The wire is connected on either side with the sliding cross-piece *b*, and forms a loop *g* beyond the bulbous extremity *f*, after having traversed its perforations. In its course the wire passes through two small holes in little wing-like processes close to the joint *e*, so that it may be kept in proper position at whatever angle the instrument may be bent. The wire I have found to answer best consists of two or three filaments of very fine annealed steel wire smoothly twisted together. Silvered copper wire is commonly used, but this bends too easily, and is apt to kink and break. Fishing gimp and salmon line gut are strong enough, and do not kink; but they are too limp to be pushed beyond the growth, if it is close to the floor or septum of the nose. Whatever material is used, it should be so proportioned in thickness as to run easily through the several holes of the instrument; and the edges of these should be so rounded as not to catch or cut the wire.

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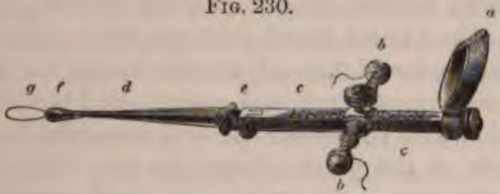
* *Principles of Surgery*, p. 476.

† Schreger, *Neuer Chiron*, vol. i. part ii. p. 197. Quoted in South's 'Chelius,' vol. ii. p. 732.

FIG. 230.



Hilton's Nasal Polypus Snare.

The manner of using this instrument is sufficiently obvious. The cross-piece is advanced as far as possible, and a good-sized loop of wire, much larger than that represented in the figure, is projected beyond the distal extremity of the instrument. This loop is introduced into the nostril with as much of the slender portion of the instrument as may be necessary, and the growth is encircled by moving the wire in the proper direction. The cross-piece is next drawn home and firmly held. The growth thus securely noosed, is then twisted and pulled from its attachment without difficulty, and with little or no risk of damage to the subjacent bone. In cases in which the attachment of the growth is high up, the wire loop may be directed into position by means of a very small blunt fork mounted on a long slender stem; and in cases in which the growth is situated very far back, the wire may be made to encircle it by aid of the finger passed through the mouth and round the posterior border of the soft palate. Portions of the mucous membrane adjoining the base of the pedicle of the polypus are sometimes brought away, but this is of little or no moment. It is obvious that with the wire snare it is impossible to inflict such damage to the bones as has too often resulted from the incautious use of the forceps. In the case of any broad based swelling, such as that of hypertrophied mucous membrane or septal abscess, the wire necessarily slips over the surface, and cannot, like the forceps, seize that which it would be undesirable or detrimental to tear away. If the pedicle of the polypi should be very thick, it may be advisable to use the wire rope écraseur, with screw movement, instead of the snare just described.

In some instances polypi may be successfully removed by the fingers alone. One forefinger is thrust into the affected nostril, and the other is introduced into the posterior nares through the mouth. When the growth is reached, and held between the two fingers, it is pushed backwards and forwards until all resistance has ceased, and it is then withdrawn through the nearest opening. Morand and Sabatier succeeded thus;* and Gross in a similar manner 'promptly removed a large gelatinoid polypus from a youth of seventeen.' In this case 'the tumour had a very narrow footstalk attached to the posterior extremity of the inferior spongy bone, which was therefore easily torn asunder.'† But this method, though apparently simple, is rarely practicable, for reasons which are sufficiently obvious.

Dr. M'Ruer, an American physician, advocates the following method. A piece of catgut is to be passed through the nostril into the mouth, and to its extremity is to be 'fastened a piece of soft, dry sponge, corresponding in size, when firmly compressed, to the narrowest part of the nasal passage.' The sponge is then to be drawn gently forward through the posterior nares, and through the nose. Dr. M'Ruer 'thus succeeded in at least ten cases in bringing away all the adventitious growths.'* This method has an appearance of clumsiness which scarcely recommends it to general adoption.

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* Former Edition of this Work, vol. iii. p. 215.

† Op. cit. vol. ii. p. 342.

In the case of large polypi, situated far back, it may sometimes be advantageous to make a button-hole-like opening through the soft palate—the 'boutonnière palatine,' of M. Maisonneuve.† The direction of the incision should be from before backwards; and it should be made in the median line. The great elasticity of the parts composing the soft palate permits a polypus of large size to be drawn through a comparatively small opening; and the same elasticity aids the subsequent closure of the wound. The polypus drawn through the opening may be cut or twisted off, or ligatured with comparative ease. After this has been done, the wound may be either left to itself, or closed by one or two sutures. So far back as the year 1747, Manne, a surgeon of Avignon, slit the soft palate in a difficult case, and at different times removed portions of the growth. He then introduced into the remaining portion several threads, by means of which he drew the polypus forwards. His fingers passed through the mouth pushed it in the same direction. The pedicle ruptured, and the tumour was withdrawn through the nostril, with a noise 'which resembled the uncorking of a bottle.' A second polypus which subsequently showed itself was similarly extracted, and the cure was complete.‡

Whichever of the methods thus described be adopted, the operation is liable to be attended by more or less hæmorrhage, which sometimes may be very troublesome, or at any rate may impede the proceedings of the surgeon. As a general rule, however, the bleeding soon ceases spontaneously, or may be easily arrested by the injection of cold water or astringent solutions. In some rare instances, however, it may be necessary to plug the nares. In every case, if there is much bleeding, and especially if the patient has suffered severely, it is better to defer the completion of the operation to a future period. And thus it often becomes advisable to operate on several successive occasions, and to remove the growths piecemeal, rather than to overtax the endurance of the patient by attempting too much at a single sitting.

Dr. Thudichum has recently very strongly advocated the use of the galvano-caustic wire for the removal of nasal polypi, especially with a view to avoid the risk of hæmorrhage; and because this method, in his opinion, is attended by comparatively little pain. The apparatus which he uses consists of a modification of Middeldorpf's platinum wire carrier, connected with a battery of five large Grove's cells. The growth is encircled by the loop of wire, which is tightened by screwing up the windlass. Connection is then made, and the portion of the growth included in the noose is quickly burnt off, and withdrawn through the nostril.* The advantages of this method when practicable are manifest. Its disadvantages are that it involves the use of apparatus troublesome to prepare, not commonly in the armamentarium of the surgeon, and formidable in appearance to the patient; and that by it, the growths are removed by a tedious piecemeal process. In one case, for example, detailed by Dr. Thudichum, the polypi were removed from one nostril in no less than fifty-five different portions; and in another case thirty-three introductions of the loop were necessary. It is obvious that only the portion included by the heated loop is cut off; whereas by the use of the wire snare (p. 301), or the forceps, a great deal more than that which the wire includes or the forceps grasp, is at once removed; indeed, a comparatively small hold suffices for the extraction of a very large and extensively lobulated growth. Nevertheless, it cannot be disputed that in some cases Dr. Thudichums's plan is of the greatest practical value.

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* Former Edition of this Work, vol. iii. p. 217.

† *Comptes-rendus,* août 1859. Ranking's *Half-Yearly Abstract,* 1859, p. 196.

‡ H. Cloquet, *Ophrésiologie,* p. 668.

After any operation for the removal of nasal polypi, whether incomplete or apparently complete, it is well to wash out the nose regularly during some considerable period with astringent or detergent solutions, by means of the nasal douche or syringe. And in some cases the insufflation of tannic acid or other powders proves of great service, either in hindering the development of fresh growths, or in aiding the destruction of such portions as may have had their vitality impaired by the operation. It often happens that, after a partially satisfactory operation, large portions of growth may thus be got rid of and washed away; and the cure may be accomplished, or the patient may be enabled to go on in comfort for a considerable period.

The extirpation of mucous polypi by means of the ligature, merits no discussion in these pages.* The method is condemned alike by reason and experience. There is scarcely any region of the body in which the presence of a sloughing mass is more objectionable than in the nasal cavities. The operation itself is not easy; and the effects are disagreeable in the extreme, even if not dangerous. Moreover, it is obvious that any growth of this kind which can be included in the ligature, may with equal ease be included and cut off at once by the wire-rope écraseur or by the galvano-caustic wire.

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* Op. cit. p. 9.

Fibrous Polypi.

Fibrous polypi are by no means so commonly met with in the nasal cavities as the softer growths described in the preceding pages, but they are far more formidable. If allowed to take their course, they give rise to the most serious results. Their extirpation is often very difficult, and sometimes impracticable; and, moreover, the operative measures requisite may be attended by considerable risk.

These growths spring from the periosteum, and are connected with it by continuity of structure. They are covered by an extension of the mucous membrane, sometimes comparatively thick, but more frequently thinned away. As a rule, they occur singly, but in some rare instances two or more distinct growths have been found.† They vary very much in shape and size, according to the degree of development they may have attained, and the direction in which they may have grown. Sometimes they are uniform in contour, and more or less globular or pear-shaped. But as a rule they are elongated and very irregular in shape, presenting finger-like prolongations, rounded outgrowths, or broad-based lobules in those parts which have encountered least resistance. They are firm and resistant to the touch, and are sometimes of almost cartilaginous hardness. They have nothing of the yielding 'oyster-like' softness of the mucous polypi. They are opaque. While growing they are usually more or less red in colour—in some cases comparatively pale, in others dark or even purplish red. When removed from the body, they are generally dull white, or yellowish. But the tint varies in different specimens, and in different parts of the same specimen. They are traversed, not only superficially, but also throughout their substance, by numerous thin-walled blood-vessels, which are sometimes varicose. Hence their proneness to bleed. They cut somewhat crisply, and on section present a more or less uneven, and occasionally almost mammillated surface. They are composed, for the most part, of closely-woven strands of white fibrous tissue, which spread out from the pedicle. They contain very few elastic fibres. In different specimens a variable proportion of spindle-shaped nucleated cells, similar to those of sarcomatous growths, are to be found. Sometimes these are so numerous, and the general appearances are such, as to indicate that the growth must be considered 'fibroid' rather than 'fibrous,' and that it approaches in character the more malignant forms of new growth.

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* The method of applying the ligature by means of the double canula, is described by Sir Wm. Fergusson in his treatise on *Operative Surgery*, 3rd edition, p. 580. But though he describes, he does not commend the operation.

† MM. Lallemand and Cruveilhier record the case of a young man in whom were found on post-mortem examination, two polypi of the kind under discussion. One grew from the posterior part of the superior turbinated bone and adjoining parts on the left side, the other from below the opening of the sphenoidal sinus on the right side.—*Dict. en.* 60 *vol.*

Instances are on record in which deposits of carbonate and phosphate of lime have taken place on the surface of these growths,* as well as others in which the growths themselves have undergone a process of partial calcification.†

Fibrous polypi occasionally spring from the periosteum of the lateral walls of the nasal cavities or pterygo-palatine fossæ, and somewhat more frequently, perhaps, from the floor of the nose.

In some instances they appear to have originated in the antrum, and to have extended from thence into the nose. But in many cases, in which they have been supposed to have taken such a course, further investigation has shown their origin to have been very different.‡

There can be no doubt, however, that polypi of the kind under discussion most frequently take origin from the periosteum of those portions of the base of the skull which form the roof of the naso-pharyngeal cavity. In such case they are 'naso-pharyngeal polypi' properly so called, and as such are described in the next section. But it is often very difficult, and sometimes indeed impossible, to determine the precise point of origin of a fibrous polypus until the nasal cavities have been fully exposed to view by operation.* The difficulty is increased by the tendency which these growths have to acquire secondary attachments. Such secondary attachments probably result from adhesion taking place between opposed surfaces rendered bare by ulceration from pressure. In the case of a little child, under the care of M. Marjolin, it was found on post mortem examination that, though the growth evidently sprang from the basilar process and body of the sphenoid, yet it spread along the septum and had numerous adhesions to different parts of the pituitary membrane, and especially to the posterior surface of the soft palate.†

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* H. Cloquet, op. cit. p. 688.

† Bourdilliat, *Gazette médicale,* 1868; 'Fibrome calcifié.'

‡ This was notably the case in the very remarkable instance narrated by Mr. Prescott Hewett, which is quoted on page 462 of this volume, from *Med.-Chir. Trans.* vol. xxxiv.

Whatever their origin, these polypi increase in size with comparative rapidity. At first they mould themselves somewhat to the cavities in which they lie, and grow forwards, or backwards and downwards, in the direction of least resistance. When more advanced, they exert injurious pressure from within upon the walls of the nasal cavities, and in a certain sense overcome the resistance they encounter. They are liable to cause ulceration and destruction of the mucous membrane, perforation of the septum, and expansion and displacement of the nasal bones, and superior maxillæ; or gradual thinning and absorption of these bones may result from the pressure to which they are subject. The palate is pressed downwards and forwards; and the cavity of the mouth is encroached upon. In all such cases the visage is proportionately distorted. The cheeks become more or less prominent, and the nose expanded and flattened. The eyes appear, or actually are, more widely apart than natural. The general aspect thus produced is very characteristic. It has been not inappropriately termed 'frog-face.' In some cases the distortion is symmetrical. In others, one side is more obviously distorted than the other. If one side only of the face is affected, the other remaining perfectly natural, the presumption is that the disease, whatever it may be, is in the antrum rather than in the nose, although the cavities of the latter may be encroached upon.

In the earlier stages the symptoms are similar to those produced by the mucous polypi, and it may be difficult to make the diagnosis. But the fibrous growths are firmer and more fixed than the mucous, and they do not undergo any change of volume under different atmospheric conditions. The symptoms therefore are more severe and more constant, and when the nose is once blocked, the obstruction to respiration is more absolute and unyielding. Moreover, the fibrous polypi give rise to frequently recurring epistaxis. This is not only a very characteristic symptom, but it may prove the source of much anxiety and danger. The discharge from the nose associated with the presence of a fibrous polypus is as a rule more scanty, and thinner, more sanious, and more liable to become foul and ozænic than the mucous discharge usually associated with the presence of the softer growths.

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* In a case described by M. Gerdy, a polypus growing from one side, perforated the septum, and appeared on the other side, and thus gave rise to the opinion that two polypi were present.—*Nélaton*, op. cit.

† *Gazette des Hôpitaux*, May 25, 1861.

In the later stages, when the polypus can be distinctly seen and felt by the surgeon, and still further when from its size it has caused distortion of the face, there can be little or no difficulty in making out the nature of the growth, whatever doubt there may remain as to its precise origin and connections. Careful exploration, and pressure in different directions alternately by the fingers, and the passage of a bent probe round the free parts of the polypus, first on one side, then on the other, may often afford reliable indications of the probable position of the original pedicle, as well as of such secondary attachments as may have been formed. If any question should arise as to the possibly malignant nature of the growth under examination, conclusive evidence may be obtained by microscopical examination of a small portion removed by means of a grooved needle or fine trocar or canula.

Treatment.—The treatment requisite consists in the complete extirpation of the growth by operation. Medicinal treatment is of no service whatever, except in supporting the general health and strength under the depressing influence of the loss of blood and general suffering occasioned by the growth. Local applications are worse than useless; they may stimulate and irritate, but they can neither arrest nor destroy the growth.

The method of extirpation, that it is best to adopt, depends upon the size of the growth, and the situation of its pedicle. If the growth is not large, and its point of origin is neither very far back nor very high up, and if also, its pedicle can be reached and is not too broad, it may be removed through the nostril or posterior nares, like the mucous polypus, by means of the wire snare, the écraseur, or the galvano-caustic wire; or if it should be deemed desirable, a ligature may be applied, and the growth may be allowed to slough off; but I cannot forbear repeating that this method of treatment is open to serious objection, and is not free from danger. It may, however, be justifiable in certain exceptional cases. One fatal instance has come to my knowledge; and in that instance, even if the patient had survived, the operation would have been only partially successful, for it was a comparatively small portion of the growth only that had been included in the ligature.

In cases in which the growth is large, or in which its point of origin cannot be determined, or is situated very high up or far back, resort must be had to one or other of the operations described in the next section, on naso-pharyngeal polypi.

Naso-pharyngeal Polypi.

The growths so named are, as already intimated, fibrous polypi growing from those portions of the base of the skull which form the roof of the naso-pharyngeal cavity, or rather from the periosteum which covers them. The periosteum of the basilar process of the occipital bone, the body of the sphenoid bone, and the immediately adjoining parts, is peculiarly thick and vascular. Its blood supply is very free, and derived from several different sources. Hence, perhaps, its liability to give origin to new growths, and the rapidity with which such growths often increase in size.

The naso-pharyngeal polypi, properly so called, invariably spring from some part or other of the limited area thus indicated. They are, however, prone to acquire secondary attachments, and thus may arise various sources of difficulty in arriving at a satisfactory conclusion as to their point of origin. Sometimes they become adherent to the walls of the nose, and consequently may be supposed to be nasal polypi. Occasionally they extend down behind the pharynx, and in such case may appear to have arisen from the anterior surface of the spinal column.*

In structure these growths differ in no respect from the fibrous polypi of the nose already described (p. 305); and it must be borne in mind that polypi, whether fibrous or mucous, which arise from the nasal parietes, may extend into the pharynx as well as along the cavities of the nose, and thus may become, in a certain sense, naso-pharyngeal. But the growths now under discussion are distinguished by their origin, by the rapidity of their growth, by the remarkable manner in which they invade the various neighbouring cavities, and by the very serious results to which they may give rise.

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* These several points are ably discussed in the Treatise of Dr. Robin Massé, *Des Polypes naso-pharyngiens*, Paris, 1864; and also in the elaborate essay of M. d'Ornellas, *Des Polypes fibreux de la base du Crâne, dits naso-pharyngiens*; Paris, 1854. And in the essay by M. Beuf on the same subject; Paris, 1857. Also by M. Brevet, *Des Polypes naso-pharyngiens*; Paris, 1855.

During the earliest stages of the growth of a naso-pharyngeal polypus, the only obvious symptom is frequent epistaxis. The blood may pass from the nostrils, or may enter the pharynx and be ejected from the mouth. Frequent epistaxis from both nostrils must always be regarded as a suspicious symptom, and one indicating the necessity for careful examination. As the growth increases in size, respiration through the nose becomes gradually more and more impeded, and the patient suffers from a sense of 'stuffiness.' At this period rhinoscopic examination at once reveals the existence of the growth; and on digital exploration it may be felt as a rounded, hard, resistant tumour. If left to pursue its course, it soon presses upon the soft palate, and thus interferes with easy deglutition, and gives rise to frequent inclination to vomit. Sometimes, when attempts are made to swallow, liquid portions return through the nose. As the malady advances, thin, sanious, or purulent, and sometimes fœtid discharges begin to flow more or less abundantly from the nostrils, and the epistaxis becomes more frequent and more severe. The growth generally enters one side of the nose first, and then invades the other, either by penetrating the septum or by growing round its posterior border. Still later, the spongy bones and septum become more or less extensively destroyed, in consequence of the pressure of the growth. The nasal bones and superior maxillæ also become destroyed to a variable extent, or expanded and pushed to either side; and the countenance is consequently distorted. Sometimes the growth enters the maxillary sinus, and presses upon the floor of the orbit; sometimes it seems to pass round the bone (or through it), and issues under the skin of the cheek, passing along the cutaneous aspect of the bone, and pressing together the walls of the antrum.*

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* See the remarkable case published by Mr. Prescott Hewett, already referred to; *Med.-Chir. Trans.* vol. xxxiv.

Sometimes the growth sends off prolongations through the sphenopalatine and sphenomaxillary openings, and even extends under the zygomatic arch into the temporal fossa. MM. Maisonneuve and Chassaignac record cases in which growths of this kind had penetrated the pterygomaxillary fissure, and passed through the pterygoidean space between the muscles towards the face.* In other cases extensions are sent into the frontal and sphenoidal sinuses. And in others, again, prolongations may pass through the sphenomaxillary fissure into the orbit, with or without destruction of bone, and so cause protrusion of the eyeball.† As a further consequence, the optic nerve may be put on the stretch, and vision may be impaired. Very frequently the orifices of the Eustachian tubes are obstructed, and the sense of hearing is dulled. Very frequently also, the nasal ducts are compressed, and more or less constant epiphora results. But the most serious consequences follow, when, as occasionally happens, the growth penetrates to the interior of the skull. In such case no treatment is of any avail. The growth may enter the skull either through the sphenoidal fissure, or, after having caused absorption of bone, from the sphenoidal cells, or through the cribriform plate of the ethmoid bone. Suppuration, compression of the brain, coma, and death, are the only results to be looked for.

A remarkable illustration is recorded by Samuel Cooper, as having come under observation at St. Bartholomew's Hospital. The patient suffered from an enormous polypus, which occupied both nasal fossæ. The eyes were four inches apart, and the left eye was absolutely blind. Paralysis supervened fifteen days before death, which followed a period of coma. On post-mortem examination, it was found that a portion of the growth almost as large as an orange, was within the skull. The anterior lobe of the left hemisphere of the brain was almost entirely destroyed.

These growths are much more frequently met with in males than in females. They may occur at almost any age, but are most common in young people. In 122 out of 164 cases which have come under my observation, or of which I have collected particulars, the growth evidently commenced in each case before the patient had reached the age of twenty. M. Marjolin records the case of a little girl only two years of age who died from the effects of a growth of this kind, which had probably commenced during early infancy.* On the other hand, Dr. Robin Massé quotes from Richard a case in which the patient was fifty-five years old. But it is quite the exception to meet with an instance at so advanced an age. Indeed, in any case of supposed fibrous polypus of the nose, if the patient has long passed the middle period of life, the growth must be looked upon with suspicion, inasmuch as it will most probably prove to be malignant in character, and not a simple fibroma.

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* Massé, op. cit. p. 17.

† See case under the observation of M. Chassaignac, quoted by Massé, op. cit.

As already indicated, these growths not only give rise to considerable disfigurement and severe suffering, but sooner or later may prove fatal in result. Death may ensue from exhaustion caused by repeated hæmorrhage, constant discharge, disturbed sleep, and inability to take sufficient food; or from slow or even rapid asphyxia; or from implication of the nervous centres.

Treatment.—Complete extirpation of the growth by operation is the only treatment upon which any reliance can be placed.

In some rare instances, it is true, naso-pharyngeal polypi have spontaneously sloughed away. In the case of a young woman in St. George's Hospital, Mr. H. C. Johnson 'proposed to divide the soft palate, and endeavour to remove the whole growth from the pharnyx; when, fortunately for the patient, the morbid tissue was attacked by rapid sloughing, which so entirely removed it, that no trace could be discovered of any part remaining.'†

A somewhat similar result occurred in the case of a boy under the care of Mr. Birkett, in Guy's Hospital. In this case it was proposed to extirpate the polypus after removal of the upper jaw; but the parents would not consent. On one occasion hæmorrhage took place to such an extent as to render necessary the application of a ligature to the common carotid artery. The tumour subsequently sloughed, and the whole came away through a large opening in the cheek. Seven years afterwards the patient was quite well. The sinus in the cheek had healed up. There was no recurrence of the growth.‡

Instances are also recorded by Saviard,§ Bonnet,‖ Vimont,¶ and others.** But so fortunate an issue is far too rare to justify the expectation of its occurrence.

Local applications, whether of exsiccatives, astringents, caustics, or escharotics, in solution, in powder, or in substance, are worse than useless. The actual cautery, in the form of the guarded hot iron thrust into the growth, has passed into deserved oblivion; and in like manner the use of the ligature has been well nigh abandoned, on account of the difficulty of its application, the dangers to which it may give rise, and the uncertainty of its results. In some cases, however, it is possible that the growth may be of such moderate size, and its pedicle so situated, that the ligature may be applied, and lead to results at any rate temporarily successful.

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* 'Proceedings of the Société de Chirurgie;' Paris. *Gazette des Hôpitaux*, May 25, 1861, already referred to.

† *British Medical Journal*, vol. i. 1858, p. 61.

‡ *Ibid.*, p. 119.

§ *Recueil d'Observations chirurgicales*, p. 112. Paris, 1784.

‖ Bonnet, tome iv. obs. 92, p. 457.

¶ Quoted by Brevet, *Des Polypes naso-pharyngiens*, p. 16. Paris, 1855.

** See the treatises by Robin Massé and D'Ornellas, already referred to.

In all cases it is necessary to remove the growth completely; for if any portion should be left, there is very great probability of recurrence. Such being the case, and the anatomical relations of these growths, and the size they often attain before coming under treatment, being duly considered, it becomes obvious that it must be very seldom that they can be removed satisfactorily without some preliminary operation by which more space for surgical manipulation is obtained than naturally exists.

Sometimes, however, if the growth has not extended far into the cavities, and more especially if its pedicle is comparatively small, it may be removed through one or other of the natural openings. Thus, I saw my colleague, Mr. Forster, tear away a growth of this kind from the naso-pharynx of a boy in Guy's Hospital by his fingers alone. The result was eminently satisfactory. In another case I successfully removed a similar growth by means of a wire-rope écraseur, the end of which was so curved as to pass round the posterior border of the soft palate.

Mr. Bryant records a very remarkable case in which the growth 'had originally appeared in the right nostril, but had ultimately occluded both posterior nares, and pushed forward the soft palate. The écraseur (through the nose) was employed for its removal, but only a small and weak one could be introduced, and the screw could only be tightened gradually. In five days it came away, but the polypus did not fall off; for a time it appeared to shrivel away, but in nine months the boy was sent back to the hospital as bad as ever. The tumour was again carefully examined, and was found to be attached to the posterior wall of the pharynx. On this occasion whipcord was used instead of wire, and again the écraseur came away on the fifth day, but this time the tumour came with it.' * In this case reunion may have occurred between the parts gradually severed by the wire, or the polypus may have continued to derive its nourishment through some secondary attachment previously formed. Mr. Bryant informs me, he has reason to believe that no reproduction of the growth is again taking place.

In cases in which the pedicle of the polypus can be reached and encircled, it is probable that the galvanocaustic wire may be very advantageously employed.† But satisfactory experience

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* *Medical Times and Gazette*, vol. ii. 1864, p. 126. Also *Path. Trans.* vol. xviii. p. 106.

† Bryk, *Wien. med. Halle*, 1862, p. 223. This method appears to have been first employed by Middeldorpf, in 1853. See Robin Massé, op. cit. p. 73.

of this method without preliminary operation, is as yet wanting. In every case in which the growth has attained considerable size, and is so firmly wedged into the cavities that its points of attachment cannot be easily reached, it is better, as a preliminary measure, to make a full and sufficient opening through the soft parts and bones. Various methods have been from time to time described, and practised with more or less satisfactory results. These methods may be divided into—1st, those which involve complete or partial ablation of the upper jaw; 2nd, those in which the upper jaw is temporarily displaced and restored to its position after the removal of the growth; 3rd, those in which the face is untouched, and the opening is made through the palate, with or without the absolute removal of the natural structures.

In deciding on the best operation to be adopted in any particular case, the surgeon must be guided by the size, extent, and possibly ascertained attachments of the growth with which he may have to do. In every case sufficient space must be obtained.

Ablation of the upper jaw (entire or partial) is neither so difficult nor so dangerous an operation, nor is it followed by so much after disfigurement as might be expected; and some modification or other of this method, is probably most likely to prove successful in a large proportion of cases in which the growth has attained considerable size, and has extensively invaded the various cavities.

Temporary displacement of the upper jaw involves some difficulties in the after treatment; but further experience may show how these are to be overcome, and the obvious advantages of the method may be more generally secured.

Operations through the palate alone do not always permit the full exposure of the origin of the growth. This method, therefore, is liable to prove inefficient. Its value, however, is amply attested by many successful cases.

Ablation of the upper jaw to facilitate the removal of a naso-pharyngeal polypus appears to have been first suggested by Whateley, and first practised (though with incomplete success) by Syme, in the year 1832.* To continental surgeons, however, is due the credit of having fully established the practicability and the value of this operation.* It is now generally recognised as a legitimate and successful surgical procedure. Mr. Tatum appears to have been the first in this country to have operated with successful results.†

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* *Edinburgh Medical Journal*, vol. xxxviii. p. 322. See also Verneuil, *Proceedings of the Société de Chirurgie*, mars 14, 1860.

The various operative proceedings for the total or partial resection of the upper jaw, will be found described in the essay on DISEASES OF THE MOUTH.

There are certain obvious objections to the total removal of the jaw. Even if the result should be successful so far as the extirpation of the polypus is concerned, more or less disfigurement remains: the removal of the floor of the orbit may endanger the eye; the teeth on one side are necessarily lost, and mastication may be impaired; and lastly, a large opening remains between the mouth and the nose, and articulation may be seriously affected. The latter several objections may be, for the most part, overcome by the adaptation of an artificial obturator at some subsequent period. The extent, however, to which the chasm left after the operation gets filled up in course of time by firm fibrous cicatricial tissue is very remarkable.

It fortunately happens, that in many cases partial resection of the maxilla suffices to afford the requisite space. The floor of the orbit,‡ and even the dental arch may be left intact.§

A good example of partial resection of the maxilla for the removal of a naso-pharyngeal polypus, is recorded by Mr. Pick as having come under the care of Mr. Holmes in St. George's Hospital.‖ The patient (a man), twenty-seven years of age, suffered from characteristic symptoms. 'The operation was commenced by a single incision from the inner canthus of the eye, down the side of the nose, and continued through the upper lip in the mesial line. The flap having been dissected up, the bone was first divided by a key-hole saw through the malar tuberosity: the bone was then divided into two, leaving the floor of the orbit, by the bone forceps, carried along the lower margin of the orbit. The other attachments having been divided in the usual manner, and the bone having been severed from the soft palate, it was easily removed, and the origin of the tumour from the base of the skull exposed. The polypus was now grasped, and easily extracted. . . . The flap was re-adjusted. . . . There was very little bleeding during the operation. . . . The man made a good recovery, and left the hospital with the wound quite healed, five weeks after the operation.'

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* A full history of the operation, and copious details of the various modifications adopted by different surgeons, are given in the already quoted treatise of Dr. Robin Massé.

† *British Medical Journal*, January 1858, p. 119.

‡ Guérin, *Éléments de Chirurgie opératoire*, p. 228. Paris, 1858. Maisonneuve, *Gazette des Hôpitaux*, août 21, 1860.

§ Bérard, *Dictionnaire en* 30 *vol.*, tome xxviii. p. 367.

‖ *St. George's Hospital Reports*, vol. ii. p. 162.

Temporary displacement of the maxilla followed by replacement immediately after the removal of the growth, may be successfully accomplished in the manner illustrated by the following case, the details of which were brought before the Académie de Médecine by M. Huguier, in 1861.*

The patient, a young man twenty years of age, had suffered during a period of about six years from the presence of a naso-pharyngeal polypus. Various ineffectual attempts at extirpation had been made from time to time. On admission the left eye was unduly prominent The left side of the nose generally appeared enlarged, and the left ala was distended. On inspection through the nostril a reddish mass could be seen, and on digital exploration through the mouth, a firm rounded growth could be felt pressing down the soft palate, and filling the left naso-pharyngeal opening, and passing round to the right. The symptoms were severe. M. Huguier operated in the following manner. The mouth being widely opened, an incision was made though the soft palate. A narrow band or skein of thread was then carried by means of Belloc's sound along the left nasal fossa, passed through the opening made in the palate, and one end of it drawn through the mouth. This was intended to be used in making downward traction on the jaw in the later stages of the operation. Next, an incision was made through the whole thickness of the cheek, from the left labial commissure to the anterior border of the masseter. A second incision was carried alongside of the nose through the lateral attachment of the ala and through the middle of the upper lip. The flap having been raised, the superior maxilla was cut through horizontally by means of a saw. The line of section extended from immediately above the maxillary tuberosity to a point above the floor of the nasal fossa. The first incisor tooth on the right side having been then removed, the saw was applied from before backwards to the hard palate on the left side of the septum. The base of the pterygoid apophysis was next cut through by means of strong bone forceps. Thus the inferior portion of the maxilla was detached from the other bones of the face, and only kept in connection with them by the mucous membrane of the hard palate and alveolar process. By means of a chisel used as a lever, aided by traction upon the band of thread introduced at the beginning of the operation, this portion of the bone was turned downwards and towards the right. In this manner a wide opening was made into the pharynx, and the polypus was seen adhering by a broad base to the basilar process, the back of the pharnyx, and the base of the left pterygoid process. The pedicle was cut through, and the polypus removed in four portions by means of a gouge and strong curved scissors. Frightful hæmorrhage ensued, but the application of the hot iron proved effectual. The maxilla was replaced, but it was found difficult to retain it in position. The wounds in the face were closed by five sutures. A gutta percha mould was subsequently fitted to the parts, and worn for some time, and threads were passed round the teeth. In spite of the difficulty long experienced in maintaining the parts in proper apposition, the case terminated very satisfactorily.†

Other methods, similar in principle to the one described, but more or less different in detail, have been practised and recommended by Langenbeck,[*] Roux,[†] and others.[‡] In some cases it suffices to cut through the alæ of the nose along their junction with the cheek; through the nasal processes of the maxillæ and the skin and mucous membrane covering them, and through the septum. When this has been done the nose may be turned forcibly upwards, and replaced after the growths thus exposed have been removed.

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* *Gazette des Hôpitaux*, 1861, p. 337.

† Ibid. p. 336.

The method devised and advocated by M. Nélaton,[§] leaves the face untouched, and the superior maxilla undisturbed in position. The operation is performed as follows. The soft palate is first divided in the middle line throughout its whole extent and thickness. A longitudinal incision is carried along the posterior half of the hard palate down to the bone. From the anterior extremity of this incision two others are carried obliquely outwards, one on each side to the root of the alveolar process. The flaps of periosteum and mucous membrane are detached from the bone, and reflected outwards on either side. The bony palate is next perforated, and cut away by means of bone forceps. The mucous membrane and periosteum of the floor of the nose are then divided in the median line, and the flaps turned aside; as much of the vomer as may be necessary is removed. In this manner a large opening is made into the naso-pharyngeal cavity, and the growth that may be there is exposed. After the growth has been removed, and its pedicle completely destroyed by the application of the hot iron or some escharotic, the flaps may be brought together. But M. Nélaton recommends that this should not be done until some time after the operation, nor until the complete destruction of every portion of the pedicle has been effected. At any subsequent period staphylorraphy may be practised. Deglutition and articulation are but little impaired, or not at all.

This method has been adopted and variously modified by many continental surgeons,[‖] but it does not appear to have found much favour in this country, on account of the comparatively limited access it affords to the base of the skull, and its probable inefficiency in case the prolongations of the growth should be extensive.* But for these objections it would certainly seem preferable to the other methods described. The operation itself is not difficult; it is attended by comparatively little hæmorrhage; no obvious deformity results; mastication, deglutition, and articulation are but little impaired, or not at all.

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[*] *Deutsche Klinik*, 1861, p. 281; and Schmidt's *Jahrb.* cxiii. p. 195.

[†] *Gazette des Hôpitaux*, 1861, p. 354.

[‡] See Robin Massé, op. cit.

[§] *Bulletin de la Société de Chirurgie*, vol. i. p. 159.

[‖] M. Robin Massé, op. cit., quotes or records twenty-six cases, in thirteen of which the results were perfectly satisfactory.

The naso-pharyngeal polypus, by whatever preliminary operation it may have been exposed, must be very carefully removed; no portion of it must be left. Much bleeding is likely to take place if cutting instruments are used, but this can generally be arrested by the actual cautery, or by styptics. It is well in every case to cauterise the point of origin thoroughly by means of the hot iron, the gas jet of M. Nélaton, the galvanic cautery, or some powerful escharotic.

With the view of avoiding the various difficulties and dangers of such operations as have been thus described, M. Nélaton attempted, some years ago, the destruction of a naso-pharyngeal polypus by means of what may be called the *electro-chemical* method.† Two platinum needles, connected one with each pole of a 9-celled Bunsen's battery, were thrust into the polypus, and the current was allowed to pass for some minutes. The operation was repeated six times at intervals of ten days. The result is stated to have been eminently satisfactory. The patient left the hospital completely cured.‡ This method may be practised without any serious preliminary operation.§

Cartilaginous Growths.

Cartilaginous growths are occasionally, though rarely, met with in the nasal cavities. For the most part they are attached by broad bases to the septum and adjoining parts of the floor of the nose. They cause more or less obstruction to respiration, and alteration of voice. Sometimes they are attended by troublesome coryza and frequent sneezing; these symptoms have been very marked in two cases recently under my observation. Occasionally recurrent headache is complained of. In some cases the septum is pushed towards the opposite side, and thus the appearance on first inspection may be deceptive.

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* See Mr. Pick's article in the *St. George's Hospital Reports*, vol. ii. p. 150.

† This method is worthy of note on account of the interest recently excited by Dr. Althaus's Treatise on *The Electrolytic Treatment of Tumours.*

‡ *Med. Times and Gazette*, March 16, 1867.

§ Robin Massé, op. cit. p. 78.

Mr. Ure records a case, the particulars of which illustrate very well the general history of growths of this kind, and the treatment to be adopted. A young man, eighteen years of age, had suffered ever since he could remember from a fulness in the right nostril. The patient had the peculiar 'frog-face,' supposed to be characteristic of polypus. No air passed through the affected nostril. On examination a tumour was found connected with the septum and floor of the nose, and blocking up the inferior meatus on the right side. Mr. Ure made an incision through the side of the nose, in order to get room, and then gouged out the growth, which was exceedingly compact in structure. The next day there was oozing of blood, and some erysipelatous swelling. The wound healed nicely, and the patient recovered rapidly from his distressing symptoms.*

A parallel case came under my own care in Guy's Hospital four years ago. The growth was removed with equally satisfactory result, and when I saw the patient a few weeks ago, there was no appearance of any recurrence.

Osseous Growths.

Exostoses springing from some part or other of the nasal parietes, or from some neighbouring bone, may invade the cavities of the nose, and give rise to symptoms more or less resembling those produced by other growths. The degree of hardness and fixity presented on careful exploration, establishes the diagnosis. Very considerable disfigurement may sooner or later result.

In some cases cartilage in variable proportion, and variously disposed, enters into the formation of growths of this kind.† One of the most remarkable instances on record is that of Lochland Shiel, an Irish labourer, twenty-four years of age, who was under the care of Mr. Morgan, in Guy's Hospital, in the year 1835.‡

The patient stated that he first perceived a small tumour in the right nostril when he was fifteen years of age. This gradually increased, and, 'at the time of his admission into Guy's Hospital, occupied the whole of the right side of the face; the right nostril being enormously expanded and closed by the enlargement of the tumour, which from its size, completely concealed the eye on that side, and extended downwards into the mouth, being there connected with the palatine and alveolar processes of the right superior maxillary bone. . . .

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* Similar cases are recorded by Erichsen, *Lancet*, 1864, p. 152. Bryant, *Lancet*, 1867, p. 225.

† See case recorded by MM. Trelat and Dolbran, *Bulletin de la Société de Chirurgie*, 1862, p. 261.

‡ *Guy's Hospital Reports*, series i. vol. i. p. 403. *Sequel*, series i. vol. vii. p. 491. Illustrative specimens, Guy's Hospital Museum, No. 1666^{32}, wax models, 38^{10} and 38^{12}, cast 65. This case is especially quoted because, in spite of its very remarkable character, it does not appear to be generally known.

The bones apparently implicated in the disease were the ossa nasi, superior maxillary bone, vomer, and the inferior turbinated and malar bones.' No description can convey an adequate idea of the size and shape of the tumour, and the enormous general disfigurement produced. 'The tumour throughout its whole extent was almost uniformly firm, and of a bony hardness.' Mr. Morgan removed the growth (or a great part of it). 'A section of the tumour[*] proved that it was composed of an outer hard thin shell of bone, completely enclosing a morbid mass of spongy cancellated structure, devoid of all appearance of sarcomatous or fungoid disease.'

The patient made a fair recovery, and lived for nearly seven years. He then died, but the particulars of the termination of the case were not ascertained. It is, however, impossible to look at the cast[†] taken after death without marvelling that life could have been prolonged to such a period. The growth appears to have been simply enormous—larger indeed than the head itself.

True exostoses, whether cancellated, compact, or eburnated in structure, and mixed bony and cartilaginous growths springing from the bones, must be distinguished from those curious 'osseous tumours,' which are occasionally met with in the nasal cavities and adjoining sinuses, but in no other part of the body. The history of tumours of the class now referred to, is at present very imperfectly made out. Instances are very rare, and the opportunities afforded for investigation are necessarily very limited.

The so-called '*Osseous Tumours of the Nasal Fossæ and Sinuses of the Face,*' appear, according to recent researches,[‡] to originate in the membranes, mucous or periosteal, which line the cavities, rather than to spring, like true exostoses, from their bony parietes. At any rate, they comparatively early separate from the normal bone, if even they have been in the first place connected with it. It has been suggested that these growths may be somewhat analogous in their mode of development and subsequent separation to the antlers of the *Cervidæ*. In the several instances that have come under observation, they have increased until they have attained very considerable size, and have produced very great disfigurement, accompanied by more or less severe suffering. In the majority of cases, they appear to have taken their origin in the frontal sinuses, or in the nasal fossæ. In some instances they have 'sloughed' away spontaneously, as in the celebrated case recorded by Mr. Hilton.* In others, they have been successfully removed by operation, as in the following case recorded by M. Legouest,† which may be quoted in brief by way of illustration.

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[*] Preparation 1666^{32}, described as 'Cartilaginous Tumour,' which was removed from the face.

[†] Cast 65, wax model 38^{12}, Guy's Hospital Museum.

[‡] Dolbeau, *Bulletin de l'Académie de Médecine*, tome xxxi. p. 107. Dr. Paul Olivier, *Sur les Tumeurs osseuses des Fosses nasales*; Paris, 1869. *Compendium de Chirurgie*, tome iii. pp. 98 et 564.

The patient, a young soldier, had suffered for many years with uncomfortableness in the left nostril, which had obliged him frequently to introduce his finger. One day he felt far back a small swelling, which appeared to be on the floor of the cavity. Seven or eight months afterwards, this swelling was as large as a bean, and as hard as a stone. Some time subsequently, the nose became deformed, and four months later the growth completely filled the left nasal fossa, and a disagreeable discharge flowed from the nostril. Severe headache and frequent epistaxis soon supervened, and the discharge became purulent. Under such circumstances the aid of M. Legouest was sought, eighteen months after the appearance of severe symptoms. A hard immovable tumour with irregular surface could be felt occupying and distending the left nostril. The soft palate was depressed, and behind and above it could be felt a larger tumour than that which occupied the anterior part of the nose. The patient breathed through the mouth only, and swallowed with difficulty. The voice was nasal. An abundant sanious and purulent discharge flowed from the nostril. After a tedious preliminary operation, terminating in partial resection of the upper jaw, the whole of the growth was removed without difficulty, but *no point of bony attachment could be discovered.* The patient made a good recovery. In size, form, and general aspect, the growth resembled somewhat the os calcis. Its surface was uneven—smooth in some parts, rough in others. Its substance was very dense, very compact, and eburnated. It was impossible to make out any vestige of a pedicle.

Several similar cases are quoted by Dr. Olivier in his treatise on these tumours. The general conclusions indicated are, that such tumours differ from ordinary exostoses, not only in their mode of development, but also in the method of treatment to be adopted. Ordinary exostoses must be cut off from their attachments; but these 'osseous tumours' require the full and complete exposure of the cavities in which they lie, and they may then be turned out without any further difficulty. If allowed to remain, they go on increasing in size until by the pressure they exert, they cut off their own supply of nutriment. They then spontaneously separate and slough out, after having caused more or less extensive destruction of the parts upon which they may have pressed.

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* *Guy's Hospital Reports*, series i. vol. i. p. 495. Museum Prep. 1666^{48}, drawings 3^{50}, 3^{51}, 3^{52}.

† *Mémoires de l'Académie de Médecine*, 1865–66, p. 147.

Malignant Growths.

Osteo-sarcomatous, sarcomatous, encephaloid, and much more rarely scirrhous growths, sometimes invade the nasal cavities, or spring directly from their walls. Such growths, as a rule, commence in the bones themselves, or very speedily involve them. They generally occur either in young children, or those who have passed the middle period of life.

The age of the patient, the appearance of the growth, its proneness to bleed when touched, the foulness of the discharge to which it gives rise, and the general cachexia with which it is associated, indicate the character of the growth. If any doubt should remain, the microscopical examination of a small portion of the growth removed by avulsion, or by means of a grooved needle or fine trocar and canula, readily determines the diagnosis.

In four cases that have come under my observation, in each of which the symptoms generally resembled those associated with benign polypus, it was noticed that the soft palate, though stretched and depressed, was red and thick to the touch, instead of being pale and thin, as is commonly the case when it is pressed down by a mucous or fibrous polypus.

As a general rule, it may be stated that if the malignant character of the growth is indisputably established, it is better to let matters take their course; for in this situation it is well-nigh impossible to effect such complete extirpation as can be of any real benefit. In some cases, however, if the nature of the disease is recognised early, and its progress is not rapid, it may be not only justifiable, but even advisable to attempt the removal of the growth. But if this should be attempted, all the adjoining parts likely to be infected must be removed also. In this way, life may sometimes perhaps be prolonged, or at any rate suffering may be diminished.

ARTHUR E. DURHAM.

NOTE.—In preparing this Essay, free use has been made of that by Mr. Ure in the former edition of this work. But so many additions have been made, and the sections of that treatise have been so far modified, that the Essay may be considered as an original one—for which the present author is solely responsible.

ICAL DISEASES CONNECTED WITH TEETH, AND THEIR TREATMENT.

limited space allotted to this Essay compels me to ego, to a great extent, dwelling on those diseases nost commonly fall under the special care of the and to confine myself, almost entirely, to those surgical *tions* which are associated with, and dependent upon, l conditions of the teeth.

ubject of 'teething,' and the ailments of childhood con- on that process; the irregularities and deformities ng on the shedding of the temporary teeth, and the of their permanent successors, would alone occupy, if with justice to their importance, more space than can ded to the entire Essay.

her matter which is of the last importance in the treat- the teeth, *stopping* or *plugging* carious cavities and other of surface, is a subject of such extent, and involves so eliminary discussion upon purely physical questions, that possible to enter here upon its consideration. Indeed, tment of those most usual and ordinary abnormalities of h, irregularities of the position of the permanent set in eople, and carious cavities, entail to so great an extent ular mechanical knowledge in combination with surgery, science and art, that it has naturally, and indeed inevit- sumed that *special* character of practice and of surgical nt which we see at present accorded to it; and for these combined with the want of space which I have before ed, I am constrained to refer the reader, for the con- on of these subjects, to those works which have been y devoted to their elucidation.

e following pages, therefore, I shall describe, as far as my limits allow, those surgical diseases and abnormalities, with their treatment, which are more or less connected with the teeth, under the following heads:

I. Alveolar abscess.
II. Painful and difficult eruption of the wisdom-teeth.
III. Tumours of the gum.
  (*a*) Epulis.
  (*b*) Congenital hypertrophy of the gum and alveolar borders of the maxillæ.
  (*c*) Polypus of the gum.
  (*d*) Vascular tumours.
  (*e*) Warty tumours of the gum.
IV. Tumours of the tooth-pulp.
  (*a*) Polypus of the tooth-pulp.
  (*b*) Sensitive growth of pulp after fracture.
V. Odontomes, or Tumours of the hard tissues of the teeth.
  (*a*) Enamel nodules.
  (*b*) Exostosis.
  (*c*) Hypertrophied fangs.
  (*d*) Dentine excrescence.
  (*e*) Warty teeth.
VI. 'Abscess' of the antrum.
VII. Dentigerous cysts.
VIII. Alveolar and maxillary necrosis from
  (*a*) Phosphorus fumes.
  (*b*) Eruptive fevers.
IX. Hæmorrhage after extraction.
X. The application of obturators and artificial palates.

1. *Alveolar abscess.*—One of the commonest consequences of dental caries, and occurring occasionally independent of any apparent disease in the teeth, is this troublesome, and too often ill-understood, malady. The results of this condition, when appearing on the external surface of the face (cheek, jaw, or chin), are occasionally so remote from any obvious connection with the teeth, and the patient's symptoms so fail to indicate its association with them, that the true nature and cause of the suppuration is lost sight of, and an easily-remedied disease is indefinitely protracted.

Alveolar abscess may be defined as a suppuration around the fang or fangs of a tooth, usually carious, accompanied by absorption and expansion of the bony walls of the alveolus or alveoli, and the enlargement of the little pus-sac, the matter gradually finding its way to the surface either along a canal by the side of the fang of the tooth opening at the edge of the gum, or through the gum itself at a point corresponding to the end of the root (or roots) of the tooth implicated. When, however, the fangs are unusually long, or the reflection of the mucous membrane, from the gum to the cheek or lip, is very superficial, this same discharge may burrow still more outwardly, and find its exit upon the surface of the face.

The pathology of alveolar abscess, especially in its commonest form of 'gum-boil,' has not been generally understood. The first change which occurs in the development of this condition consists in the deposit around the extremity of the fang or fangs of the tooth of organisable lymph, which is soon differentiated into obscure fibrous tissue. Coincident with this development, the bone around the end of the tooth-fang becomes absorbed, and a little hollow in the jaw is produced, varying in size from a lentil-seed to that of a horse-bean. Thus far the change is simply one of plastic inflammation: it occurs, as far as my observations go, with every carious tooth, and in those with more than one fang is most conspicuous at the extremity of that root which corresponds with the side or part of the crown where the caries occurs.

These changes are often accompanied by absorption, to a varying amount, of the extremity of the fang; and this appears to be part of the same action as produces the excavation in the maxilla itself, which is occupied by the plastic exudation. There is generally, too, a thickening of the alveolar periosteum, which raises, and often loosens, the affected tooth.

It is the lymph surrounding the extremity of the fang, and occupying the little cavity produced by the bone-absorption, that is the seat of suppuration in alveolar abscess. Whatever may be the first actual point of suppuration, when sufficient pus is formed for recognition, it is found in immediate contact with the fang of the tooth—the bare naked crusta petrosa, and surrounded by the half-organised lymph, as by a sac. The form of this sac varies considerably; it is usually spherical or pyriform where the fang is single, or if the tooth have more than one fang, and the fangs are distinct; but where the fangs are close together, or the root is simply cleft at its extremity, as is often the case with the superior premolars, the sac is frequently ouble and bilocular. The sac is sometimes of large size, and is equently very long; sometimes it is fringed with fimbriated rocesses of lymph, which occupy an elongated excavation in ıe maxilla. When suppuration is established, the sac enlarges ccording to the amount of matter formed, and the rapidity ith which it is developed; and this is accompanied with a ilatation and absorption of the bony walls of the abscess, specially towards the region at which the matter is 'pointing.' hese latter changes are often very extensive and very rapid; o that the whole of the osseous tissue of one wall of the alveolus ıay be expanded and thinned into a mere papery film, and then ompletely absorbed in comparatively few hours, the periosteum, vith the organised lymph that has been the seat of the suppuration, alone remaining as the membranous sac of the abscess. The development of an alveolar abscess is generally accompanied by a deep throbbing pain at the part affected, and often by great general swelling of the face, sympathetic of the more internal nischief. The distortion of the countenance from this cause is sometimes prodigious, especially when the upper incisors or canines are the cause of the abscess, and the attack is acute. In such a case the nose will be pushed on one side, the eyelids become œdematous, closed, and ecchymosed. In other instances, where the character of the affection is less intense, a mere indurated, indolent, and hard swelling on the side of the jaw is all that is produced; the maxilla being distended at the extremity of the tooth's fang, and but little bone absorbed.

The development of an alveolar abscess is sometimes associated with febrile symptoms of extreme severity. M. Robert* describes a case of alveolar abscess, resulting from a carious wisdom tooth, which led to necrosis of the surrounding bone, and diffuse purulent infiltration of the side of the neck. The case terminated fatally.

Alveolar abscess is usually confined to the tooth or one fang (when the tooth has more than one) which has been the cause of the affection, and around which the plastic exudation has formed. Occasionally, in two- or three-fanged teeth, the intervening bone between the extremities of the individual fangs becomes absorbed, and one abscess may be common to all.

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* *Conférences de Clinique chirurgicale,* par M. A. C. Robert, p. 145. Paris, 1860.

Again, there is another form of alveolar abscess which occasionally affects the upper jaw and front teeth in persons of cachectic and debilitated constitution, in which suppuration appears to affect generally the tissues surrounding the roots of several teeth in a diffuse manner: the teeth become excessively loose, and the front of the jaw around them becomes boggy and suppurates abundantly, the discharge usually flowing around the necks of the teeth. In such cases the teeth are often, indeed generally, sound, and are probably only secondarily affected. I incline to the opinion that this form of alveolar abscess is dependent on constitutional taint—scrofulous or syphilitic.

The 'pointing' of the matter in alveolar abscess is a question of some moment, both as regards diagnosis and treatment; and the circumstance that the discharge of pus may occur upon the surface of the face, entailing with it very great disfigurement, adds serious importance to this consideration.

An alveolar abscess affecting the one-fanged teeth may find vent for its secretion by a gutter or channel along the course of the fang, the matter being discharged at the neck of the tooth. This seldom occurs to the many-fanged teeth, and is most commonly seen with the inferior incisors—the pus flowing from the front edge of the gum at a point corresponding with the particular tooth affected. The commonest position at which the thinning and bursting of the abscess takes place is on the outer surface of the jaw, at a point corresponding, as nearly horizontally as may be, with the extremity of the fang of the affected tooth, and *piercing the gum within the mouth.* In such common cases the diagnosis is perfectly simple and obvious, and the abscess is easily associated with the individual tooth that produces it. There are, however, instances in which the pointing of the abscess, after having taken a lengthened and burrowing course, is remote from its cause. The most striking peculiarity of this kind is where a circumscribed collection of matter appears far back in the palate, occasionally at the very posterior extremity of the hard palate, dependent on affection of one of the six front upper teeth. Such a condition may readily fail to indicate its true explanation, and may suggest the presence of necrosed palatal bone; it is important, therefore, in the practice of general surgery, to recollect that this obscurity may present itself. As far as my own experience has gone, caries of the *superior lateral incisor* tooth has generally been the cause of this remote pointing abscess. Why it should be so, I cannot say; but the pathoexamples where the orifice occurs on the surface of the face. The tooth is the equivalent in these cases of a sequestrum; and it is, as far as the pulp-vitality goes, a dead organ. The fistulous canal leads to the dead tooth, as a sinus to the dead bone; thus far the two conditions are alike, and their appearances are alike; but there are obvious differences. In alveolar abscess there is less general swelling, except at first in acute cases, and there is an absence of the diffuse indurated lymph-infiltration of the cellular tissue which is present in bone-necrosis; the canal leading to the abscess is single, usually short and direct, and not burrowing and complicated as in bone-disease;* moreover, there is generally an absence of fœtor in the discharge. The locality in a doubtful case, being the neighbourhood of the jaw, is in favour of the idea of a tooth being the cause; and an appeal to the state of the teeth seldom fails to settle the question definitively. Sometimes, however, a difficulty may arise from the fact that the cause of the abscess is a mere stump, overlapped by prominent gum; or, what occasions still more obscurity, the abscess may consist of a large excavated cavity in the substance of the jaw, into which the stump has fallen and become loose and free. A probe and the elevator will in either case complete the investigation.

While alveolar abscess, when connected with the integument of the face, is very apt to be mistaken by surgeons for diseased bone, the reverse has happened where a dentist has attributed to carious teeth morbid conditions which have been coincident with them, though not produced by them. I have known this occur in an instance where the patient was suffering from scrofulous caries of the malar bone near its suture with the superior maxilla—a mistake which led to the extraction of two slightly damaged teeth in no way connected with the disease. Again, I have seen one of the sub-maxillary lymphatic glands, rather adherent to the bone and in an early state of suppuration, mistaken for an outward-pointing alveolar abscess. Such errors as these, leading at most to the extraction of carious, though innocent, teeth, are trivial in comparison with those more frequent mistakes in which alveolar abscess is confounded with bone-disease, and an easily cured malady is allowed to run its course unrestrained, and permanently disfigure the face.

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* I once saw a very remarkable exception to the above, nearly universal, rule. A lady consulted me on account of a burrowing abscess, which first burst immediately below the lower jaw on the right side. This orifice closed and another formed lower down: this also closed, and was followed by another in the neck. The burrowing continued, and when I saw the patient, many months after the first discharge of pus, there were two sinuses opening about an inch *below* the right clavicle. A carious first lower molar had caused the suppuration, and its removal was followed by the immediate healing of the sinuses.

The *cause* of alveolar abscess is either caries of a tooth or death of the organ; the latter usually the result of mechanical violence, which has separated the pulp from its continuity with the subjacent nervous and vascular structures. It is uncommon to see the affection arise in association with sound and apparently uninjured teeth, though this sometimes occurs.

The *treatment* of alveolar abscess depends upon the stage at which the case is seen. In the earliest period, when suppuration is rather impending than established, the malady may be cut short by the extraction of the affected tooth, or by the removal of the stopping in a stopped tooth. Often it is undesirable to extract a particular tooth that may be threatening or causing the abscess; and in that case recourse should be had to leeching the gum freely, the administration of brisk purgatives, and abundant hot fomentation of the face at the swelling part. This mode of treatment, when it does not arrest the malady, much mitigates the attendant suffering. When matter has formed, and the wall of the abscess has sufficiently thinned, the pus should be evacuated by a puncture made through the gum with a narrow thin scalpel. This is followed by immediate and complete relief, and the general swelling associated with the advent of the attack rapidly subsides; but the disease, in the very great majority of cases, remains in the form of a continuously pus-discharging fistula. It is very rare indeed for the pus-secretion to cease: it may be so diminished that the external orifice may close for a time, but it is pretty sure to burst out again and again; though I am confident (contrary to the general published opinion) that in a few exceptional instances the disease ceases altogether, the offending tooth still remaining in the mouth.

When an alveolar abscess shows symptoms indicative of external pointing, immediate and active treatment is necessary. The offending tooth should be taken out; and in case it breaks in extracting, every vestige should be sought and removed. If matter has formed, and there has been decided thinning of the integument, showing its near approach to the surface, not only should the tooth be extracted, but a vertical incision should be made between the cheek and the jaw, so as to cut across the pus-containing canal; else the matter is apt to *pocket*, and cause progressive absorption to the surface; and though the tooth be removed, the abscess may thus still open externally. This vertical incision between the cheek and the jaw is also useful after the removal of a tooth, even when the external opening has occurred; it cuts across the bands of lymph which glue the integument down to the bone: in this case a piece of oiled lint should be introduced and kept in the wound, to prevent the adhesion and reunion of the cut surfaces. In all cases of alveolar abscess, extraction of the diseased or dead tooth is *the* cure; and I know but of two circumstances which peremptorily interdict this mode of treatment. First, where a strongly-pronounced hæmorrhagic diathesis forbids the extraction of teeth altogether; and secondly, in those cases where the abscess is associated with the upper incisor teeth of young people in whom the jaws have not yet assumed their adult form, and where the permanent dentition is, as yet, incomplete. In this latter case it is of much importance to retain the teeth, even if reduced by decay to mere fangs, till the adult form of the jaws is established, even at great cost of suffering and discomfort. The earlier removal of the teeth would be followed by such contraction of the maxillary arch as would be incompatible with a proper replacement by artificial teeth of the natural ones missing.

II. *Painful and difficult eruption of wisdom-teeth.*—The advent of the wisdom-teeth is very often accompanied by painful and distressing symptoms, that may be protracted through many months, or even years, unless relieved by surgical interference. These circumstances arise from the position occupied by the wisdom-teeth, so close to the joint of the lower jaw, where the mucous membrane is reflected from the gum to the cheek and fauces, combined with the very common condition—that the jaw is not sufficiently elongated backwards to allow the dentes sapientiæ to range in the horizontal series with the other teeth. This mechanical difficulty not only prevents the proper evolution of the wisdom-teeth, holding them back in their bony bed, but it often perverts their direction of growth and dislocates them. Annoying and very painful as are often the symptoms attendant on difficult cutting and misplacement of the upper wisdom-teeth, they are trivial in comparison with those which occur in similar conditions of the lower.

The ordinary misplacement of the upper wise teeth is either backwards or outwards, or in both directions combined. When the tooth points backwards, every time the mouth is closed its crown comes in contact with the mucous membrane, passing up on the base of the coronoid process; when the direction is outwards, which is more common, the tooth projects into the cheek, and when the jaws are brought together, a portion of the mucous membrane in this region is nipped and pinched. This is a very painful affair: the surface becomes ulcerated and extremely tender; there is a partial cicatrisation, and the structure becomes stiff and hard as well as painful. Beyond this, however, the symptoms never (as I believe) extend, and the removal of the offending tooth is always followed by complete and immediate relief.

The difficulty which most commonly occurs with the inferior dens sapientiæ is attributable to insufficient room in the jaw: the tooth grows normally in direction and in position as regards its neighbour in front, but, from an imperfect lengthening of the horizontal ramus of the jaw, the birth of the crown is only partial and incomplete: the tooth is upright, but only its front cusps emerge, while the hinder cusps are still covered in with gum, or even the upper wall of the bony loculus in which it was formed. This produces a terrible pinching of the mucous membrane over the tooth every time the jaws are brought together. Before, however, the enamel eminences of the tooth's crown make their appearance, the soft structures behind the second molar become much inflamed, and often suppurate, the pus-secretion appearing to be within the enamel sac of the tooth, between the tooth-crown and the membrane covering it. The inflammation, to which this impaction and pressure give rise, extends to surrounding tissues: the cheek and the fauces suffer; the movements of the jaw become stiff and painful; and deglutition is difficult, and attended with suffering like 'sore-throat.'

Next in frequency to the foregoing malposition is that in which the wisdom-tooth is developed horizontally forwards, more or less. It is attended often with serious consequences. This direction is sometimes combined with an inward leaning; and very rarely the crown of the tooth points outwards. This latter dislocation is very unusual; but the most severe case of suffering from misplacement of the lower wisdom-tooth which I have ever seen was of this variety.

There is one peculiar symptom frequently associated with the painful cutting of a lower wisdom-tooth, which adds to the difficulty of investigating the condition of the parts, and still more interferes with the treatment: this symptom is *spasmodic contraction of the masseter muscle*, of a continuous and persistent character, the result of contiguous irritation; not a spasm which varies in intensity, but a true *tonic* spasm, the muscles being permanently *set*, so as to keep the jaws nearly closed, and susceptible only of very slight separation. The jaw can usually be opened to a small extent, and then is definitely fixed; it feels as if there were a mechanical obstacle to further movement; but it is not so; for when the cause of irritation is removed, the spasm rapidly ceases, and then the mouth can be fully opened. This same form of spasm sometimes occurs from caries of the molars, irrespective of crowding. The pain that accompanies and precedes the cutting of a wisdom-tooth varies very much in different individuals; but it is frequently of a dull aching character, like rheumatism, for which it is occasionally mistaken; it is diffuse and erratic, extending up the side of the head, and down to the shoulder. There is not unfrequently a good deal of swelling of the soft parts in the neighbourhood of the tooth, and this sometimes extends to the cheek and to the eyelids even, and below the angle of the jaw: the lymphatic glands beneath the jaw also occasionally become enlarged and tender.

The most distressing result, however, that occurs in these cases is the suppuration which sometimes attends the difficult eruption of the tooth. In slight cases, even where there is no misplacement or want of room, but simply a restrained progress, from an unusually dense or cartilaginous overlying gum, pus will be occasionally formed; being secreted (as it has seemed to me) within the capsule of the tooth, by that which was the 'enamel pulp.' In severer cases, the pus burrows among the areolar tissue, around the periosteum of the jaw; the neighbouring soft structures become infiltrated with lymph, and the integument is glued irregularly to the bone; pus points at different spots, often remote from its original source; and the whole cheek may be undermined with a series of sinuses. I have seen the side of the face, from the tragus of the ear and the angle of the jaw behind, to the angle of the mouth and mental foramen in front, a web of pus-discharging fistulæ, and which, after their cure (by the mere removal of an impacted wisdom-tooth), left the integument thin, and bound down to the bone, with the glossy, tense, cicatrix-like aspect of a recently-healed burn—a great and permanent disfigurement. While such cases are in activity, they have very much the appearance of necrosed bone. And, indeed, they do occasionally lead to necrosis of more or less of the jaw; but the severest suffering and most suspicious symptoms may occur without such a complication. What is the precise anatomical condition of these burrowing suppurations I am not prepared to say positively. They are not apparently connected with the fang of the wisdom-tooth, like an alveolar abscess. I believe they commence in the enamel sac, before any portion of the crown pierces the gum; and their subsequent course of burrowing is from the matter *pocketing* in a downward and onward progress. As long as any part of the crown of the tooth is covered by gum, pus will be secreted by the under surface of the overlying portion. I have seen an impacted wisdom-tooth give rise to that form of serous cyst known as a 'dentigerous cyst.' In those instances where the crown of the wisdom-tooth projects forwards, the second molar very often suffers. The posterior fang is apt to be eroded by absorption, and the whole tooth may become necrosed; the first of these conditions is very common: I have met with several instances of it; in four specimens of lower second molars now before me, which were removed on account of forward pressure of wisdom-teeth, the posterior fangs are excavated by absorption in all; in two the pulp-cavity is closely approached; in two it is opened, and in one of the latter there was total necrosis of the whole tooth; the periosteum was completely stripped from both fangs, which were unattached in their sockets, and bathed in pus. These affections of the second molar should be taken into consideration in balancing the merits of the plans of treatment which may be contemplated in any particular case, and will, I think, favour that course of proceeding which I believe ought in many instances to be followed, but which is not now usually adopted.

Treatment.—The wisdom-tooth of the upper jaw, when misplaced, suggests but one mode of treatment; it by far the most often projectsoutwards; it is then useless for mastication; and if it pinches the cheek painfully on closing the mouth, it may be removed unhesitatingly and without compunction. The same may be said when it grows backwards and bruises the mucous membrane over the base of the coronoid process; the tooth is useless, and worse than useless, and should be extracted; it is very readily done, and, as far as I know, the annoyances attendant on the misplacement of the upper wisdom-tooth are never attended with that locked-jaw complication which so frequently attends the difficulties of the lower third molar eruption. In one rare instance, in which the upper wisdom-tooth grew forwards, it was found necessary to extract the second molar, on account of damage which it had occasioned by producing absorption of the neck of the anterior tooth.

In the treatment of these cases in the lower jaw, much will depend on the degree of impaction of the tooth; if it is simply covered over by a dense and cartilaginous gum, free lancing is all that may be required; but it will often have to be repeated. In young precocious people, who arrive very early at puberty, the wisdom-teeth often make their appearance before the jaw is ready for their reception, and are embedded in the base of the coronoid process, though in a proper upright position. The age of the patient in such a condition is an important question: if young, lancing the gum freely, and waiting for further elongation of the jaw, and more horizontal accommodation, may be fairly and reasonably adopted; but the same state of things in an older patient is not so likely to find this relief; and if the suffering of the patient is great, extraction of the impacted tooth will become necessary. Where the tooth emerges tardily, and where the anterior cusps have come through the gum while the posterior have remained covered, I have found great advantage not only in lancing, but in cutting away the gum which overlies the back of the tooth, so as to lay bare the whole of the masticating surface of the crown. Merely lancing the gum affords much less relief, and the cut surfaces are apt to unite, and then present a harder and more resisting impediment. If the impaction is severe, and there is no chance, from the age of the patient, of sufficient accommodation, it will be necessary to extract a tooth, so as to relieve the crushing tension; and the question now arises as to which of the two, the second or third molar, should be extracted. *Cæteris paribus*, it is always better to sacrifice the third than the second molar: the wisdom-tooth is less useful for mastication, and is more liable to decay; it is altogether less robust: but the circumstances of the two teeth may not be equal or parallel—the second molar may be carious, or it may be loose or necrosed by the pressure of the tooth behind it: in either case I prefer extracting it to the wisdom-tooth. Again, the wisdom-tooth may be so situated that its extraction may be a physical impossibility, or nearly so, as is frequently the case where it grows horizontally forwards, deep down in the jaw. Another reason, the rigidity of the masseter spasm, may render it impossible to reach the tooth. In either case I should extract the second molar, though perfectly sound, without hesitation. The distressing symptoms which are peculiar to the difficult eruption of the *lower* wisdom-tooth—the heavy pain, the sense of *tension* and *pressure*—are clearly dependent on the antagonism of the third and second molars; the former pushing forward into place, and the latter resisting its progress. The removal of the second molar puts an end to this antagonism as completely as that of the wisdom-tooth; and, in result, the one operation gives as entire and immediate relief as the other. When the second molar is extracted, the wisdom-tooth comes forward wonderfully; and an oblique or nearly horizontal tooth will advance in position, and alter in attitude, so as to become nearly, or quite, vertical, and a fair opponent to the upper second molar. In this improved position, when it can be used habitually in mastication, the dens sapientiæ is less liable to caries. But when suppuration has become established, every effort should be made to remove the wisdom-tooth itself, as the extraction of the second molar, under these circumstances, generally fails to arrest the discharge of pus.

The closure of the jaws is often so complete that, until this condition has been combated, it is impossible to get at either of the molar teeth. By pressing apart the jaws with some sort of wedge, this may be accomplished gradually, and in two or three days sufficiently to allow the removal of the tooth selected for extraction. Steel instruments have been devised on the principle of an ear speculum, composed of two shafts or blades, which separate slowly, but forcibly, by the action of a screw. I prefer a wedge of hard wood, such as beech- or box-wood, which is pushed further and further into the mouth, as the contracted masseter yields before it. It seems to obliterate the spasmodic contraction for so much at each further introduction, and in a few days such an instrument will open the mouth sufficiently for tooth-extraction. Another arrangement, however, invented by Mr. Maunder of the London Hospital, seems to possess advantages over those previously in use. It consists of a cone of box-wood or ivory, upon which is cut a spiral screw-worm, gradually increasing in diameter and in thickness of the worm: it resembles the shell of a univalve mollusc, such as a whelk-shell, only the spire is more elongated and drawn out. In cases where closure of the mouth is brought about by spasm induced through the painful eruption of a wisdom-tooth, occurring as it does in early life, the teeth in the front of the mouth are almost always firm, and would readily bear the wedging force. Upon introducing the point of Mr. Maunder's 'gag' between the incisors, or canines, or premolars, and slowly turning the instrument, it evenly and in regular progress, separates the jaws, and, as I have thought, with quicker results than any other method.

In extracting an impacted wisdom-tooth one accident will occasionally arise; namely, the crushing of the inferior maxillary nerve beneath the tooth-fang. It is immediately attended by loss of feeling in the teeth and lower lip of that side. This has occurred twice to myself. In each case sensation slowly returned and was quite re-established in a few weeks.

III. *Tumours of the gum.*—(*a*) Epulis: (*b*) Congenital hypertrophy of the gum and alveolar borders of the maxillæ: (*c*) Polypus of the gum: (*d*) Vascular tumours: (*e*) Warty tumours of the gum.

Epulis.—'The term "epulis" has been vaguely applied to various tumours that are found in and beneath the gums. The etymological meaning of the word (*ἐπί, upon, οὖλα, the gums*), entirely referring to position, and not to structure, is likely to have caused and to continue this confusion. Where, however, distinction has been drawn, it has been applied to those hard and densely fibrous tumours that arise from the surface of the alveolar processes, involving the periosteum, and by their expanded growth stretching the otherwise healthy gum over them. These are essentially different in origin, history, and anatomical structure, from the loose flaps, and often pedunculated masses of gum, mere hypertrophied integument, that are not unfrequently seen in the neighbourhood of decayed teeth, and to which the designations "polypus" and "fungus" of the gum have been appropriately given.'*

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* 'Specimens of Epulis,' by S. J. A. Salter, *Trans. Path. Soc.* vol. v. 1854.

An epulis tumour consists of a hard dense mass growing slowly and evenly from the edge of the alveolar process usually between two standing teeth, and more commonly on the labial or buccal aspect than the lingual. The point at which this growth generally makes its first appearance is beneath and involving the little tongue of gum which exists between the necks of two contiguous teeth: as it progresses in size, it displaces the neighbouring teeth, one usually more than the other: it has for the most part a broad base, and increases in basal area more than in projecting growth. The situation in which an epulis commences is liable to a good deal of variety: though usually at the free edge of the alveolar process, it may form at a distance from it; but I believe it is always associated with porous vascular bone, nearly connected with the periodontal membrane, and does not spring from the compact tissue limiting the outline of the bone. The growth sometimes commences *in* the tooth-socket. As I have remarked, the *endosteal* membrane shares in the genesis of an epulis tumour, and the fibrous growth appears to burrow, so to speak, into the substance of the bone, producing a general expansion of the whole structure. The surface of the tumour is like that of the surrounding gum; it is, however, sometimes mottled, and not infrequently slightly but broadly and flatly lobulated. It is as insensitive as the surrounding gum, and is not liable to bleed: when manipulated, it is tense and elastic. The tumour varies in size indefinitely—from the size of a pea to that of a walnut, or larger. It is generally stated that epulis tumours are more common in the upper than the lower jaw: this coincides with my own experience. I happen to have met with them in the proportion exactly of two of the former to one of the latter. The epulis tumour appears to have a certain relation to the teeth in whose neighbourhood it forms. It almost always makes its appearance where there *are* teeth: it usually invades one in a very marked degree more than any other near which it may be situated, by dislocating it and pushing it out of place: it has nothing to do apparently with caries of the tooth: the removal of the particular tooth, with excision of the tumour, is almost always accompanied by immediate and complete cure of the disease.

Occasionally these tumours appear where teeth have been removed and the gum seems to be edentulous: it will, however, generally be found in these instances that a fang of one of the teeth has been left behind, and is associated with the irritation that has caused the morbid growth. One of the most severe examples of this malady which I have seen, consisted of a bilobular mass, the size of a large walnut, extending, on the left side of the lower jaw, from the dens sapientiæ to the canine tooth, the four intermediate teeth having been removed. The excision of the tumour had been repeatedly performed, but it always returned. Its removal on this occasion disclosed the remains of one fang of the first molar tooth in its very axis: this was extracted, and the disease did not again make its appearance. I believe this will generally be found the case where the tumour forms upon an apparently edentulous region of the jaw. Epulis has its origin in the osteal membrane of the alveolus. The bone of the alveolar processes is very vascular, and almost cancellated in its loose open structure. The endosteal membrane which lines this cancellated bone, the periosteum which covers it, and which lines the tooth-sockets and the fibrous tissue of the gum, are all continuous, and alike share in the development of an epulis tumour. The bulk of the tumour consists of a dense web of fibrous tissue; and from its basal attachment, and passing into its substance, are usually small growths of bone. The fibrous tissue interlaces pretty regularly—some fibres being parallel to the surface, and others radiating from the base, intersecting the former at right angles. The bone-growths may be thin needle-like spicula or little flakes: at the point whence these bony processes arise, the tumour receives its main vascular supply, and the subjacent bone is very porous. Mr. Cæsar Hawkins mentions an instance of an epulis attached only by a pedicle to the gum, in which there was a nucleus of bone. This could not at any time have had bony union with the jaw; but the circumstance indicates, in a physiological sense, the osteal character of these fibroid developments. Epulis tumours are perfectly innocent, nor do they, I believe, ever pass into a malignant character. Sometimes, though rarely, they ulcerate on the surface; but this is only under the influence of external agencies, such as produce ulceration of any portion of the gum: they may then become painful.

The histology of epulis tumours is consistent with their history—locally recurrent as long as the circumstances under which they occurred are maintained, destroyed by the removal of their local nidus, and never impregnating the system. Epulis tumours are always, I believe, a form of 'fibro-plastic;' a combination of fibrous tissue and myeloid cells, the proportion of the two constituents varying indefinitely. In general, the main bulk of the tumour consists of fibrous tissue; but sometimes the myeloid-cell element preponderates, and may form the major portion of the growth.*

The *treatment* of epulis is very simple; it requires early and complete extirpation with the knife, and according to the extent and inveteracy of the case it may also need the removal of contiguous teeth and subjacent bone. These latter circumstances refer to an important circumstance in the *pathological history* of the disease: it is this, that as long as the alveolar process remains upon which the tumour grew, and which must necessarily be as long as the teeth which are implanted in it are not removed, so long will the tumour be inveterate, so often will it return, however accurately and carefully it may have been removed. Such, at least, is the very general rule. But when the alveolar process is gone, it shows no tendency to return. And it is a remarkable circumstance, that the spontaneous absorption of the alveoli that follows the extraction of the teeth is of itself, *in many instances*, where the disease is confined only to these processes, enough to prevent its recurrence. That is to say, if the tumour be removed to a level with the gum, and the contiguous teeth be extracted, the alveolar process vanishes by absorption, and the disease no more returns; though the same operation, without the removal of the teeth, may have been performed unsuccessfully any number of times previously. In a first operation when the disease is of limited extent, it will be well to try the result of its simple removal by the scalpel without the extraction of teeth or the cutting away of more bone than can be accomplished with the knife. The bone about the base and axis of the tumour being vascular and spongy, the knife readily cuts away small portions. Any subsequent sprouting of granulations in an undue or threatening degree should be checked and repressed by some caustic, and for this purpose nitric acid has been especially recommended. If the disease recurs, as it too often does, the same operation should be repeated, and accompanied by the extraction of a tooth or teeth whose socket or sockets have been implicated. Unless the disease have a deep hold on the bony substance of the jaw, it will seldom be necessary to cut away any large amount of bone; sometimes, however, this is the case; or the growth may have started deep in the socket of a tooth. In such an instance it may be necessary to extirpate a considerable amount of bone. A V-shaped portion or a cubical mass may be readily cut out by means of a Hey's saw and bone-nippers, according to the form and extent of the particular tumour. It will never, I believe, be necessary to go far below the limit of the alveolar process; for it is with the alveolar bone that the disease is essentially connected. In the lower jaw I would urge the necessity of never cutting through the entire bone, as the breaking of the maxillary arch most seriously interferes with the position of the remaining portions of the bone, and thus disturbs the normal opposition of the teeth in the two jaws relatively.

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* 'Specimens of Epulis,' by S. J. A. Salter, loc. cit.; 'Myeloid Epulis of Lower Jaw,' by J. Hutchinson, *Trans. Path. Soc.* vol. viii.

Congenital hypertrophy of the gum and alveolar borders of the maxillæ.—In 1859 I had an opportunity of seeing a very remarkable example of disease, which is, perhaps, best defined by the above title, under the care of Mr. Pollock, at St George's Hospital. At that time there was, I believe, no recorded example of this curious tumour-like growth; nor had any instance of it been published, as far as I am aware, until a case was described and figured by Gross in the second edition of his *System of Surgery*.* This case was not only the same in essence, but was singularly like Mr. Pollock's in all particulars.

Two similar cases have since been recorded. One occurred in University College Hospital under the care of Mr. Erichsen, and is described by Mr. Heath.† The other is published by Mr. Waterman,‡ an American Surgeon.

Mr. Pollock's patient at the time of her admission into the hospital was eight years old. At birth nothing was noticed unusual in her mouth, but a fortnight after a tooth was cut, and by the fifth week six had appeared. It was then remarked that the gums were full and thick, and puffy. They continued to increase in bulk, and at two years of age they were cauterised, and all the temporary teeth which had appeared were extracted. At birth the child had an unusual quantity of hair on the head, and also much on the arms and legs: when taken into the hospital this peculiarity was very striking; the hair of the head was coarse and rank, and grew low on the forehead, and in front of the ears on to the cheeks. The arms and legs were covered with hair. The patient was epileptic.

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* *A System of Surgery*, &c., by S. D. Gross, M.D.; Philadelphia, 1862. 2nd edition, vol. ii. p. 535, fig. 330.

† *Injuries and Diseases of the Jaws*, p. 180. London, 1868.

‡ *Boston Medical and Surgical Journal*, April 8, 1869, p. 167.

Before any operation was performed, the girl presented a most extraordinary appearance. A large mass, pink and smooth, protruded from the mouth, which the lips did not and could not cover. It was slightly corrugated or indistinctly lobed; the structure was very dense, inelastic, and insensitive, and appeared skin-like on the surface. The greater bulk proceeded from the upper jaw, and was most developed in the front of the mouth; but the same condition appeared along the whole edge of both jaws, that of the lower jaw being less, and covered and overlapped by the upper.

In structure, this hypertrophied mass consisted both of an expanded and prolonged development of the alveolar borders of the maxillæ, and an immense thickening of the fibrous tissue of the gum, with a proportionately exuberant growth of the papillary surface. The removal of portions of the mass by surgical operation gave opportunities of examining its precise nature. In the front of the upper jaw, where the development was greatest, the fibrous mass extended in some places more than three-quarters of an inch beyond the alveolar edge, which it thus covered in with a dense cushion. Those of the temporary teeth which had not been extracted were deeply embedded in the mass, the crowns of the second lower temporary molars being the only ones which were now visible. The crowns of all four of the six-years old teeth (first permanent molars) had appeared on account of the slightness of the hypertrophy towards the back of the mouth. A section of parts of the removed mass displayed the remaining temporary teeth completely clothed with the thick fibrous growth, the fangs embedded in sockets, but the crowns free of bone and each closely surrounded by a serous-like chamber without any communication with the surface. One of the superior central incisors was more deeply covered than any other teeth, and was nearly an inch from the surface. The fangs of the permanent teeth were developed in accordance with the age of the patient; but I observed that the crowns were still encased in the *bony* loculi, though from the age of the patient the distal wall of the bony capsules should, in many of them (incisors and first premolars), have been absorbed. In the socket of the first temporary incisors a small absorbed orifice existed, leading into the loculus of the permanent tooth, such as is usually found about five years old.

But the most remarkable point of structure in this growth was the papillary surface. The epithelium had changed into a very thick and hard epidermis, beneath which, and evenly covered in by it, were enormously long papillæ. The papillæ of gum vary from about $\frac{1}{75}$th to $\frac{1}{35}$th of an inch in length normally; but in a section, vertical to the surface, they here appear from the $\frac{1}{6}$th to the $\frac{1}{4}$th of an inch; and when by maceration the outer epiderm has been removed, the papillæ stand up like the pile of plush or velvet, and may be brushed from side to side by the finger. Kölliker* has noticed that in the mouths of edentulous old people, whose bare gums are exposed to the rough attrition of food, the papillæ become much enlarged and elongated, attaining sometimes the $\frac{1}{16}$th of an inch in length; and here, under exposure to still more physical violence, the same change has taken place to a vastly greater degree. But I apprehend that this monstrous development of the papillæ has also another meaning, and that it is an essential element of the disease; it is quite in keeping with the rough and thick skin of the patient, the abundant development of coarse hair over the surface, and also the enormous teeth. The permanent teeth which were removed by the operations are excessively large, especially the superior central incisors; these are larger than any I have before seen removed from a female mouth. All these circumstances imply a tendency to a general tegumentary and papillary hypertrophy.

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* *Mikroskopische Anatomie &c.*, von Dr. A. Kölliker, vol. ii. p. 85. Leipsic, 1854.

Treatment.—The proper treatment of this disease is obviously that which was followed in each of the recorded cases. Portions of the projecting mass were cut away with scalpels and bone-nippers till the alveolar borders were curtailed to within moderate limits. The operation was not completed at once, but was performed in detail, as the patients could bear it. In Mr. Pollock's and Dr. Gross's cases there was a slight tendency to a fresh growth where the hypertrophied masses were removed.

Polypus of the gum.—The gum is liable to a simple hypertrophy, the increase of growth—a sort of mucous tubercle—being confined to the gum structure alone, and not involving the osteal membrane, nor complicated with a growth of bone. The little tongues of gum between the necks of the teeth are liable to this affection, especially towards the front of the mouth; and they sometimes grow to such an extent, being confluent with those on either side, as to cover a considerable portion of the crowns of the teeth. This condition is usually associated with uncleanly habits; and may be generally cured and prevented hereafter by simple and easy means. The teeth should be thoroughly cleansed from tartar; the gums may be scarified: for the future the teeth should be abundantly brushed with a stiff brush, and the mouth washed with an astringent lotion, of which solution of permanganate of potass may form an ingredient. I have seen a modification of this condition, which was evidently syphilitic; the growths of the gum were *condylomatous*, and were more or less covered with very painful superficial ulcers. The symptoms readily yielded to the internal administration of iodide of potassium, and the application with a camel's-hair brush of a solution of nitrate of silver, 10 grs. to ℥j. aquæ. Hypertrophy of the gum of a truly polypus-like form not infrequently occurs in the immediate neighbourhood of teeth which are carious at their sides, and when the caries reaches the neck of the tooth: the irritation of the contiguous dentinal disease seems to stimulate this unwonted growth, and the mucous membrane bulges into the cavity and fills it up.

The cavities of two teeth carious on their contiguous surfaces are very apt to be associated with this condition, the little polypus of gum between them rising to their masticating surfaces. Such tumours are more or less pedunculated; they have a red fleshy look, and are very liable to bleed when roughly touched. The structure of these growths is in consonance with their aspect and the ease with which they bleed; they consist principally of hypertrophy of the true mucous-membrane element of the gum, especially the papillary structure: the epithelial covering is rather diminished in proportional amount, while the papillæ themselves become enormously elongated and increased in diameter, and some of the conical papillæ develop into the compound fungiform variety. These changes are accompanied by great dilatation of the capillaries which loop into the papillæ.

Polypous growths of the gum are so often dependent on the state of the contiguous teeth, that their treatment involves that of the teeth also. If the polypus, growing into a carious tooth, is extirpated, it will most probably return till the tooth itself is removed, or the condition of the tooth which had irritated the gum has been remedied. The caries should be cut away; ragged or sharp edges of tooth-substance should be smoothed and blunted, and the remaining cavity should be filled. The gum may still show some tendency to renewed sprouting, and this may be kept down for a time by the repeated application of a strong solution of nitrate of silver, sulphate of copper, or alum, when it will probably assume a healthy aspect. If the removal of the polypus is accompanied by the extraction of the offending tooth, I believe it never returns.

Vascular tumours.—The tissues about the necks of the teeth are obnoxious to the growth of vascular tumours, which vary from passive *nævus-like* swellings to those other forms of more arterial character—*aneurisms by anastomosis.* I have met with both these forms of the disease. The most common position in which it develops itself is in the front of the upper jaw, between the incisors, or canines and lateral incisors. A rather severe instance which occurred recently under my care manifested itself in the region that should have been occupied by the left lateral incisor of the upper jaw; but as the laterals were wanting in this person, the tumour formed between the canine and central incisor. It had been about six months in reaching its then size, the dimensions of a large marble flattened on the surface. It was of a purplish colour, streaked with many vessels on the surface; it was easily compressed, but was elastic, and when pressed it became pale, exsanguine, and much reduced in size; upon removing the pressure it resumed its previous aspect in a pulse or two. The surface of the growth was tolerably smooth; the base somewhat constricted, being about one-third less than the head of the tumour. The whole of the gums were very red, turgid, and swollen, and the little tongues of gum between the necks of the teeth generally were enlarged and spongy. The patient had suffered no pain, but was conscious of a constant throbbing and pulsation. The most important symptom, however, was the hæmorrhage, which had latterly become a serious source of trouble and distress; it usually occurred at night; it would ooze from the mouth and stain the pillow and sheets, and sometimes trickle into the glottis and cause momentary suffocation.

The treatment which I first adopted in this case was determined by the very *arterial* character of the tumour. I attempted to destroy it by ligature: a needle armed with a double thread was passed through its base, and each portion of the thread was tied so as to strangulate half of its attachment. The ligatures were tied tight, but did not cut through the substance of the growth. Their effect was for the time to produce complete strangulation: the tumour was tense; and the blood could not be squeezed out of it by pressure. This plan did not ultimately succeed, for the size was not permanently diminished and the circulation was re-established. I next removed the tumour by a very tight ligature, cutting it clean off; after this it returned as before, and I finally extirpated it with a scalpel, cutting freely inwards so as to remove a portion of the spongy vascular bone which seemed to form its basal axis. The bone at the base of these growths appears always to be very vascular and open in its texture. Considerable hæmorrhage followed the operation, which ceased under cold and pressure. For a few weeks the cicatrix furnished freely sprouting granulations; these were abundantly cauterised twice a week, and ultimately yielded a healthy scar. In structure this little mass when removed displayed a complicated vascular network, which, under the action of acetic acid, with the microscope, exhibited little else than an elaborate aggregation of the nuclei of blood-vessel muscle-cells. The surface was clothed with epithelium and papillæ, like the gum. I believe that no danger can arise in these cases from the use of the knife in at once extirpating the tumour; the bleeding may be profuse for a minute or two, but it soon ceases.

I have seen a vascular tumour connected apparently with the periosteum of a loose molar tooth, in which the hæmorrhage was very severe, occurring also at night to an extent that was really alarming: the tumour was a tense pedunculated mass, attached to the side of an upper molar tooth, half of the fang of which was naked. The extraction of the tooth brought away the tumour with it, which immediately shrivelled up to half its previous volume, and became soft and flabby.*

These tumours, as far as I have observed, occur in adult and middle life; they are perfectly innocent, and show no tendency to return when carefully eradicated.

Warty tumours of the gum.—The papillæ of the gum occasionally become hypertrophied into warty growths. A singular instance occurred in the practice of Sir William Fergusson, in which the papillæ were more than half an inch in length: they were soft and shreddy, and consisted mainly of loosely adherent epithelium. The tumour was removed, and recurred several times. Another example was operated on by Mr. Cock, at Guy's Hospital, in which a warty tumour, the size of a split chestnut, formed in the hard palate of a man.† This was covered with papillæ the eighth of an inch long. It consisted principally of fibrous tissue and dense coherent epithelium. I have seen a profusion of small warts on the gums associated with warts on the lips and about the face. In all cases the growths should be removed with the knife; and any recurrence should be repressed by caustic or astringent applications.

IV. *Tumours of the pulp.—Polypus of the pulp.*—In carious teeth the tooth-pulp is occasionally developed into a polypus-like growth, that fills more or less the diseased cavity. This formation is a dense, gristly, pink-coloured mass, consisting of a modification of the original dentine-forming organ: it is always attached by a constricted base to the pulp in the canal of one or more of the fangs; the mass itself is usually more or less rounded, frequently corresponding in form exactly to the carious cavity which contains it; sometimes, by a more exuberant growth, it is forced into a polyhedral shape by the contiguous structures, whose pressure curtails its further enlargement—the masticating surface of the opposing tooth in the other jaw, the distal and proximal neighbours of the tooth from which it has sprung, the tongue and the cheek; such cases as these usually occurring where the walls of the original tooth have completely broken away, leaving a distinct interval bounded by the parts I have named. In such examples it may be difficult to an inexperienced observer to make out the nature of the tumour; it may be mistaken for an *epulis*, or a gum polypus; search for the remains of the decayed tooth will settle this doubt. This polypus is very callous and insensitive to pain; it is not liable to ulcerate or bleed; but it discharges pus from its surface, especially when in contact with the walls of the carious tooth in whose cavity it forms. In structure these polypi approach, in the majority of instances, very closely to the ordinary granulations of a healing sore, consisting superficially of a mass of exudation corpuscles, through which are distributed multitudes of capillary loops, and more deeply of a fibrous tissue into which these cells have developed. In these instances the most superficial cells appear to be shed, assuming the form and aspect of pus. Rarely these granulations seem to heal, to cicatrise; and I have found a few instances in which the surface of the polypus has been clothed with a dense cuticular epithelium overlying a basement membrane folded into true papillæ. Polypus of the tooth-pulp 'most often occurs in young people, and in those in whom the teeth are imperfectly calcified, presenting that peculiar globular calcification in which the substance of the dentine becomes rapidly sodden with saliva, and carious without limit from the enamel to the pulp.' 'The physiological phenomena displayed by polypus of the pulp are very remarkable as regards both the pulp itself and the tooth—their oppositeness to the whole train of circumstances which accompany the ordinary inflammation of the pulps dependent on caries, odontalgia, lymph-deposit on fangs, alveolar abscess, &c. . . . . The pulp never undergoes intrinsic calcification, nor have we any evidence that dentine of repair is ever formed.' * Occasionally, though very rarely, teeth with polypus of the pulp, produce alveolar abscess.

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* 'Vascular Tumours connected with the Dental Periosteum,' by S. J. A. Salter; *Trans. Path. Soc.* vol. v. 1854.

† 'Papillary Tumours of the Gum,' by S. J. A. Salter, in *Guy's Hospital Reports*, 3rd series, vol. xii. p. 358.

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* 'Polypus of Tooth-pulp,' by S. J. A. Salter, *Guy's Hospital Reports*, 3rd series, vol. iv. 1858.

The treatment of this condition is very simple. If the polypus is cut away, it will certainly return; caustics and the like applications appear to have no influence in repressing it. If the tooth be extracted, it is finally eradicated; and this plan should always be adopted.

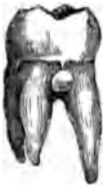
Sensitive growth of pulp after fracture.—This condition only occurs, as I believe, when a tooth with a healthy pulp is suddenly fractured by mechanical violence. When a pulp is thus exposed, it exhibits intense sensitiveness to touch, to cold or heat, or indeed to any external influence; and it frequently sprouts into a small excrescence. This excrescence is usually of a semi-transparent aspect; it is often complicated on the surface, and villus-like: when removed, like the other form of pulp-growth, it certainly returns, and of the same character as before. In microscopic structure this sprouting of the pulp differs little from the insensitive polypus; but its vitality implies a more abundant nervous supply—vascular granulations appear to the observer to constitute its histological elements. This condition remains as a permanent torture to the patient, till the tooth is extracted, when it is of course completely removed. I have known this state of tooth-pulp form a very distressing complication in a case of fracture of the lower jaw, in which a bicuspid tooth was broken and the pulp exposed: here the apparatus for fixing the displaced bone, and the introduction into the mouth of food, were attended with agonising pain, which continued till its source, a fractured tooth with a quick pulp, was discovered and extracted. Afterwards the treatment of this fracture was successfully and painlessly prosecuted. The possibility, indeed occasionally probability, of such a complication, in treating fractures of the maxillæ, should be borne in mind by surgeons; and it should be especially remembered, that when extreme sensitiveness and pain manifest themselves in such cases, a fractured tooth should be sought for.

V. *Tooth-tumours—Odontomes.*—The hard tissues of teeth are sometimes developed into tumours, which may be divided as follows:—

(*a*) Enamel nodules, or submerged cusps on tooth-fangs.
(*b*) Exostosis.
(*c*) Hypertrophied, dilated fangs.
(*d*) Dentine excrescence.
(*e*) Warty teeth.

Enamel nodules are sometimes seen on the fangs of teeth, forming little pearl-like tumours: they are essentially *submerged cusps*, each consisting of a little cone of dentine, covered by a thick tubercle of enamel, which is clothed by a true enamel-pulp.* These tumours are not known to occasion any symptoms; and are rather of physiological than surgical interest: indeed they are alluded to here, simply to complete the list of tooth-tumours. The accompanying illustration (Fig. 231), is taken from a characteristic specimen.

FIG. 231.



Exostosis on the fangs of teeth is sometimes a serious malady. An increased development of crusta petrosa may occur upon the fang of a tooth as the secondary result of other disease in the tooth—usually caries; or it may arise spontaneously—the tooth being entirely free from other abnormal change.

In the former case the thickening of the fang is usually general, around its circumference and principally on its lower third, as represented in Fig. 232. The symptoms of this condition are scarcely to be distinguished or separated from those of the tooth-disease with which it is associated.

Where the disease arises spontaneously it is apt to produce the most distressing neuralgic affections. The teeth appear sound, but they become sensitive to change of temperature and even to the touch: they elongate from the sockets and spread; with this there is more or less neuralgia of the trigeminus, or one of its terminal branches. Then one particular tooth becomes more distinctly affected than the others: all the pain seems to emanate from it: and each flash of neuralgic agony seems to start from it alone. At length the tooth is extracted and relief follows. Then usually another tooth becomes affected and requires removal: and this may, in very severe cases, go on till all the teeth in one jaw, or even in both, have been extracted before complete and permanent relief is obtained.† In these cases the exostosis usually consists of small nodules with rounded surfaces situated near the apex of the fang. Such forms of exostosis may, however, exist without producing any apparent symptoms whatever. Fig. 233 represents a magnified section of the fang of a tooth in which this nodular form of exostosis existed.

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* For the structure of these growths, see 'On Two Forms of Tooth-tumours,' by S. J. A. Salter, in *Guy's Hospital Reports*, 3rd series, vol. xiv. 1869.

† See a striking case illustrative of this condition, published by the author, in *Guy's Hospital Reports*, 3rd series, vol. xiii. p. 86. 1867.

FIG. 232.

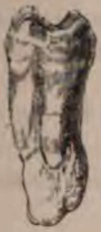
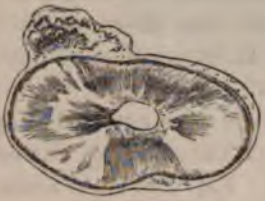


FIG. 233.



Exostosis on the fangs of teeth consists solely of an hypertrophy of the crusta petrosa, or tooth-bone, the outer layer of the fang. It is usually solid and compact in structure: though very rarely it is cancellated and vascular.*

Hypertrophied, dilated fangs.—This title best defines the nature of a very rare form of tooth-tumour, of which I believe there are only four recorded examples. One of these occurred in the practice of M. Maisonneuve and is described by M. Forget† another occurred to Mr. Hare of Limerick, and is described by Mr. Tomes;‡ another is described by Heider and Wedl;§ and a fourth is a specimen in the Museum of the College of Surgeons of England (Preparation 1022) which has been histologically examined and described by myself.‖ The latter is supposed to have been in the collection of John Hunter. The first two of these examples were mistaken for exostoses.

These tumours consist of dilatations of the fangs of the teeth; the dentine-pulp being hypertrophied into a globular mass of considerable size; and, when calcified, producing a bone-like mass, generally larger than the tooth itself. In structure these tumours consist of an outer layer of tooth-bone; then a thin shell of true dentine, enclosing the gigantic pulp, which may or may not be calcified. In the former case, this bulky nucleus of the tumour consists of a mass of osteo-dentine.

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* 'Vascular Exostosis,' by S. J. A. Salter, in *Path. Trans.* vol. vi. p. 168, Pl. viii. figs. 3 and 4. 1855.

† *Des Anomalies dentaires, et de leur influence sur la production des maladies des Os maxillaires*, par M. Forget. Paris, 1869. Obs. iii. p. 27, Pl. ii. figs. 1 and 2.

‡ *Transactions of Odontological Society of Great Britain*, vol. iii. p. 335. 1863.

§ *Atlas zur Pathologie der Zähne*, bearbeitet von weil. Prof. Dr. M. Heider und Prof. Dr. C. Wedl, p. 3, fig. 28. Leipzig, Nov. 1868.

‖ *Guy's Hospital Reports*, 3rd series, vol. xiv. p. 463. 1869.

In the only two cases in which the symptoms were recorded, there was pain with expansion of the jaw at the alveolar portion. In Mr. Hare's case there was a fistulous communication from the tumour through the jaw opening on the cheek. This discharged pus.

In each case the extraction of the tooth brought away the tumour also: the swelling subsided, and the patient recovered completely. Fig. 234 represents the specimen in the Museum of the College of Surgeons.

FIG. 234.

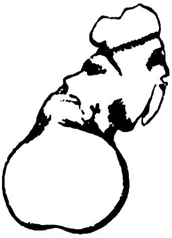
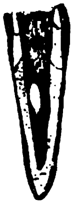


FIG. 235.



Dentine excrescence.—Nodules of secondary dentine growing from the wall of the pulp-chamber into its cavity, in teeth otherwise apparently healthy, are sometimes seen, though they have not generally been associated (perhaps from imperfect observation) with any definite symptoms. The accompanying illustration (Fig. 235), however, represents an example* where the little tumour evidently produced neuralgia, of a character very similar to that occasioned by exostoses on the fangs of teeth. The tooth was a superior central incisor, which was constantly painful: the slightest touch or change in temperature augmented the pain considerably, when it often flashed over the face and nerves of that side of the head with great severity. The extraction of the tooth, which was for the moment attended with a violent paroxysm of neuralgia, completely removed all subsequent pain. The dentine-excrescence was the only abnormal condition which the tooth presented. Its pressure upon the nerves of the pulp would readily explain the symptoms of the case.

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* 'Dentine Excrescence within the pulp-cavity of the Incisor Tooth,' by S. J. A. Salter, *Path. Trans.* vol. vi. p. 164, fig. 1. 1855.

This anatomical condition is not altogether uncommon, but it ldom causes painful symptoms.

Warty teeth.—These are among the rarest and most important of the tooth-tumours. They consist of teeth in which he tissues are hypertrophied and folded into an irregular and omplicated mass. The warty condition may affect part of the rown of a tooth; or all the parts of the tooth may be involved; r the irregular mass may consist of teeth blended together.

M. Broca, in a general résumé[*] of this subject, which he read efore the Academy of Sciences of Paris (December 30, 1867), ivides warty teeth into 'circumscribed dentinal odontomes,' nd 'diffuse dentinal odontomes;' the former being those xamples in which the warty mass occupies a portion of the ooth only; the latter, in which the whole tooth is implicated, nd its anatomical form is no longer recognisable.

Warty teeth are exceedingly rare, and I am only acquainted ith twelve recorded examples—six of the circumscribed variety nd six of the diffuse. Of the former, four were described by yself,[†] one by Mr. Tomes[‡] and one by Forget;[§] of the latter, wo were recorded by Oudet[||] (in the same individual), one by Vedl,[¶] one by Mr. Tomes,[**] one by Forget,[††] and another by Ir. Harrison.[‡‡]

In the cases recorded by myself, one was a superior lateral ncisor with a warty mass, the size of half a horse-bean, projecting from the front of the neck of the tooth. A section of this tooth for the microscope is in my histological collection. A second case, which occurred in my own practice, was that of a right lower dens sapientiæ. The mass, about the size of a small bean, sprouted from the posterior aspect of the neck of the tooth. My two remaining examples are specimens in the Museum of Guy's Hospital: one a lateral incisor, and the other a wise-tooth, both of the upper jaw: from the side of each tooth a warty mass projected. The accompanying illustration (Fig. 236), represents the lateral incisor referred to.

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[*] *Recherches sur un nouveau Groupe de Tumeurs désigné sous le nom d'Odontomes*, par M. P. Broca. *Comptes-rendus des Séances de l'Académie des Sciences*, tome lxv. p. 1117. Paris, 1867. Also in *Gazette médicale de Paris*, No. 2, Jan. 11, 1868.

[†] *Description of a Warty Tooth*, by S. J. A. Salter, in *Trans. Path. Soc.* vol. i. p. 173; London, 1855. 'Contributions to Dental Pathology: On Warty Teeth,' by S. J. A. Salter, in *Guy's Hospital Reports*, vol. iv. 3rd series; London, 1858. Same title, vol. v. 3rd series; London, 1859.

[‡] *A System of Dental Surgery*, by John Tomes, F.R.S., p. 226. London, 1859.

[§] *Des Anomalies dentaires et de leur influence sur la production des maladies s Os maxillaires*, par M. Forget, p. 25. Paris, 1859.

[||] *Cas d'exostoses sur des dents devenues monstrueuses*, par M. Oudet, in *ouveau Journal de Médecine*, p. 245. Paris, 1821.

[¶] *Grundzüge der pathologischen Histologie*, von Carl Wedl, p. 626. Wien, 54. A further description of this specimen is published in Heider and Wedl's *tlas zur Pathologie der Zähne*, part i. fig. 39.

[**] In Tomes's *System of Dental Surgery*, p. 225. London, 1859.

[††] Loc. cit. p. 5.

[‡‡] *British Journal of Dental Science*, vol. v. p. 557. London, 1862.

Mr. Tomes's specimen was a superior central incisor: the wart occupied the whole of the front of the crown of the tooth. In Forget's example, the first and second lower molars were blended into one: the crowns constituting a large confused wart-like body, while the fangs were normal. This is shown in Fig. 237.

FIG. 236.

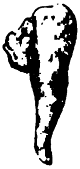
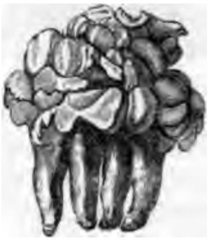


FIG. 237.



The diffuse forms of warty teeth, which have produced large cumbrous tumours, have all been developed in the lower jaw. They deserve more serious consideration.

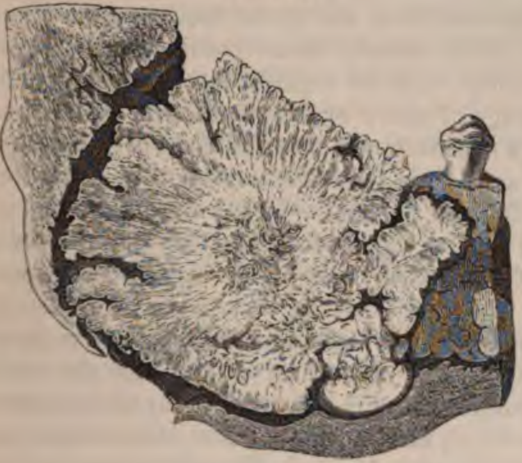
In Oudet's case a man, twenty-five years of age, exhibited in his lower jaw two hard bony tumours, occupying the premolar region one on each side. They were encrusted with salivary calculus, upon the removal of which, an irregular coating of enamel was displayed, folded into shapes like cusps and tooth-edges. These masses were evidently formed from the fused and hypertrophied germs of the two premolar teeth on both sides of the jaw. The right was removed rather easily by tooth-instruments, but the patient declined to have the other interfered with.

In Wedl's case the whole of the second lower molar tooth of the right side was developed as a large complicated mass in which the several tissues of the teeth were confounded together. It was overlying and keeping down the wisdom tooth. With a pair of forceps it was removed without much difficulty.

The specimen described by Mr. Tomes is exactly the same as the foregoing. It consisted of a confused mass of dental tissues as large as a chestnut, representing the second lower molar tooth, beneath which was buried the wisdom tooth. It occurred many years ago in the practice of Sir William Fergusson, who excised the angle of the jaw for its removal.

But M. Forget's is the most serious recorded example of this malformation. Here an enormous tumour, as large as a turkey's egg, occupied the whole of the molar region of the left side of the lower jaw. It represented two molar teeth with their tissues blended together in utter confusion and into a shapeless mass. Beneath it was a third molar tolerably well formed. The jaw began to expand in early childhood, and continued to do so till the patient attained the age of twenty, when M. Forget removed the angle of the jaw, including the tumour. The mass was covered by gum, excepting for a space on its surface the size of a sixpence. There was some pain at times: the submaxillary glands were enlarged, and several fistulous pus-discharging canals led to the base of the tumour. The accompanying illustration (Fig. 238), is from Forget's memoir, and displays a section of the tumour *in situ*.

Fig. 238.



Mr. Harrison's specimen represented the two bicuspids and canine of the left side on the lower jaw. The tissues were confounded together, and without any resemblance to tooth-form. It loosened and came away by itself.

As regards the treatment of these cases, much depends on the degree of the malformation. If it is only partial and a matter of appearance, the tooth may be removed and replaced by a better-shaped artificial representative, according to the wishes of the patient. But, should the growth be of large size and interfere with the action of the mouth, it should certainly be extirpated; and this, in nearly all instances, might be accomplished by extraction with forceps; or, at all events, without serious damage to the jaw.

VI. '*Abscess*' *of the antrum.*—The term *abscess* of the antrum conveys a very wrong impression of the real nature of this disease; it is not the suppuration of inflamed parenchyma, but the occlusion in a cavity of the purulent secretion from the surface of a mucous membrane which lines that cavity. I need not dwell on the anatomical characters of the antrum maxillare further than to notice its peculiar relations to those organs, the teeth, whose affections are by far the commonest cause in the production of the malady we are considering. These relations vary extremely, both as regards the extension of the antrum over the fangs of many or few teeth, and the degree in which those fangs approach or pierce the floor of the sinus. It may extend so as to be in immediate relation to all the teeth of the true maxilla from the canine to the dens sapientiæ, or it may be contracted to such narrow limits as only to correspond with two or three of the central ones. This variation in the size of the antrum is not mentioned in text-books of anatomy, but it is pointed out by Otto.* Occasionally a root or roots of the first molar tooth (rarely any other) extend into the cavity, free of any bony covering, and merely overlaid by the mucous membrane lining the sinus; more often, however, the palatine and external roots diverge so as to leave an interval between which the more depending sulcus of the antrum is excavated. Another circumstance in the anatomy of the antrum bearing on the purulent accumulation which constitutes abscess of this sinus, is the very variable size of the orifice which opens into the middle meatus of the nose. In some instances the aperture is barely sufficient to admit the blunt point of a probe; in others it would allow the passage of the end of the little finger. It is always much smaller in the living state when the mucous membrane lines and fills up the opening; indeed, it is the pouting of the tumid mucous membrane which closes the orifice in inflammation. The lining membrane of the antrum is liable, like all other mucous membranes, especially the Schneiderian membrane, of which it is a continuation, to inflammation and altered secretion, mucus being impregnated with or replaced by pus, and accumulating in quantity. This may occur in different degrees, both as to amount and rapidity of development; but the circumstance which here gives importance to this altered and more abundant secretion depends entirely upon the fact that it may become occluded within the sinus by means of the swelling and turgescence of the mucous membrane around its orifice. This, from such anatomical arrangement, converts a mere catarrhal inflammation, spending itself by superficial pus-shedding, into a shut expanding sac, in many respects equivalent to a deep-seated abscess, though by no means identical with that condition either in pathological history or absolute anatomy.

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* *Lehrbuch der pathologischen Anatomie des Menschen und der Thiere*, von Dr. A. W. Otto, p. 180. Berlin, 1830.

The *causes* of abscess of the antrum may be enumerated in very narrow limits. I believe that in adults, in the majority of cases beyond all computation, it is produced by dental caries, or at least by alveolar abscess, in some stage, associated with tooth-disease. It is stated that the affection may be brought on by a blow on the cheek; and an instance has been recorded in which the malady has occurred in a new-born child, and was supposed to result from the pressure on the cheek during a hard labour.

The *symptoms* of antral abscess vary much in degree; but they usually commence by dull aching pain in the cheek, with heat, redness, and fulness of the soft parts externally. In the early stage there may, or may not, be a purulent discharge from the corresponding nostril; this, however, can only occur to any marked extent before the aperture between the middle meatus and the sinus is closed. As the case advances and the matter becomes pent up, the pain assumes a throbbing character and is severe, and constitutional symptoms manifest themselves analogous to those of acute abscess; the patient has rigors and fever. With this the local symptoms change, and an expansion of the whole jaw shows itself; the malar bone becomes elevated, the fossa beneath it full and prominent; the molar teeth on the affected side appear to elongate, and, in closure of the mouth, meet their opponents too soon; the concavity of the hard palate becomes flat or even convex; the nostril of that side is more or less closed, and, in severe and protracted cases, the floor of the orbit becomes so pushed up as to protrude the eye. Hunter, in describing the symptoms of antral abscess, speaks of the eye being sometimes 'affected;' but in what manner he does not specify. Beyond instances in which protrusion of the globe* has occurred few have been recorded. The inflammation accompanying abscess of the antrum is, however, occasionally so severe as to implicate the periosteum, not only to the destruction of some parts of the maxilla, but extending beyond to contiguous fibrous structures, so as to involve the optic and other nerves in their passage from the cranial cavity to the orbit, producing blindness and fixedness of pupil on the affected side. Such cases are very rare; but one has occurred in my own practice at Guy's Hospital;[*] a second was under the care of Mr. Pollock; and a third is mentioned by Dr. Brück in Casper's *Wochenschrift*.[†] Necrosis of part of the jaw is one of the rarer accompaniments of this malady; but when any portion of the bone is affected, it is usually either the alveolar processes or the nasal plate of the maxilla.

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* An extreme case is mentioned by Frank, *De Curandis Hominum Morbis*, &c., auctore Joanne Petro Frank, lib. vi. pars 2, p. 22. Viennæ, 1820.

The manual examination of the jaw seldom fails to indicate the fluid nature of the distending material; fluctuation can be felt, and the thinned bony parietes of the abscess convey to the touch a peculiar sensation, like the handling of dry parchment: as Jourdain very characteristically expresses it, 'quand on appuyoit sur l'os, il s'affaissoit et revenoit ensuite sur lui-même en produisant une espèce de craquement.'[‡] If any doubt does arise as to the nature of the contents of an expanding antrum, I am in the habit of exploring the cavity with a minute trocar and cannula not above half the size of a wheaten straw; by this means sufficient fluid, if present, may be made to escape to ascertain its nature, and it could scarcely do injury to a solid growth if such were the character of the expansion. A grooved needle would answer the same purpose, but hardly so readily. The fluid may be too dense to pass these narrow canals; generally, however, it is not thicker than ordinary pus, and it is sometimes serous.

The ultimate issue of these cases varies very much. Occasionally the abscess bursts into the nose: sometimes through the cheek; occasionally into an alveolar cavity, burrowing along the fang, and discharging its pus at the neck of the tooth. More rarely the floor of the orbit gives way, and the pus finds its exit somewhere along the lower lid. Occasionally the orifice which communicates between the antrum and the nose yields temporarily, and there is an accommodating escape of pus: as the patient lies on the other cheek, pus will stream from the nostril of the affected side and then stop, and again make its escape by the same exit.

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[*] 'Case of Amaurosis from Abscess of the Antrum caused by a carious Tooth,' by S. J. A. Salter, *Med.-Chir. Trans.* vol. xlv.

[†] *Wiederholte Entzündungen des Antrum Highmori und Amaurose, etc.*, mitgetheilt vom Dr. T. H. Brück, in Casper's *Wochenschrift*, März 1851, Berlin. A case of a similar character was described by Prof. Galenzowski, in *Archives générales de Médecine*, tome xxiii. p. 261. Paris, 1830.

[‡] *Traité des Maladies, etc., de la Bouche*, par M. Jourdain, tome i. p. 120. Paris, 1778.

The *treatment* of this malady is so admirably sketched out by Hunter that I cannot do better than quote his own words:

'The first part of the cure, as well as that of all other abscesses, is to make an opening, but not in the part where it threatens to point; for that would generally be through the skin of the cheek.

'If the disease is known early, before it has caused the destruction of the fore part of the bone, there are two ways of opening the abscess: one by perforating the partition between the antrum and the nose, which may be done; and the other by drawing the first or second grinder of that side, and perforating the partition between the roots of the alveolar process and the antrum, so that the matter may be discharged for the future that way.

'But if the fore part of the bone has been destroyed, an opening may be made on the inside of the lip, where the abscess most probably will be felt; but this will be more apt than the other perforation to heal, and thereby may occasion a new accumulation; which is to be avoided, if possible, by putting in practice all the common methods of preventing openings from healing or closing up; but this practice will rather prove troublesome; therefore the drawing of the tooth is to be preferred, because it is not so liable to this objection.'*

Before the abscess has formed, and when, as yet, it is only imminent, it may be arrested by removing any carious tooth or teeth in the neighbourhood; and the application of leeches, fomentations, &c., with the administration of purgatives. In those cases where the pus has already accumulated, and there is no outlet, it will be necessary to make a free opening for the evacuation of the matter; and the method, which universal experience has approved, consists in the removal of a tooth, and the perforation of the antrum at its base. This has the double advantage of removing the cause in most cases, and of allowing the discharge of the matter at the most dependent part of its containing sac. The tooth whose fangs are usually most intimately associated with the antrum is the first permanent molar; and its removal, in a case of antral abscess, is especially indicated from this circumstance, and from the frail and perishable nature of the tooth itself, which gives it less often than other teeth a long tenure of usefulness. The relation of the fangs of the molar teeth to the antrum is an important consideration in the treatment of this disease: in the largest proportion of cases caries of the first molar is the cause, and its removal (opening an alveolus for further perforation) is the first step in the treatment; but any other tooth, molar, bicuspid, or even canine, whose disease should be considered its cause, ought in preference to be extracted, as the absorption around the fang of a carious tooth would render the perforation of the antrum easy, while, by such a selection, this preliminary step would remove the exciting cause of the disease. Indeed, as a rule, it is well to extract all carious teeth from the side of the upper jaw affected with antral abscess. The extraction of the abscess-causing tooth is frequently followed by discharge of the contained pus, in consequence of the fang having extended into the antrum, or the floor of the sinus having been absorbed, resulting from the diseased tooth. It is generally necessary to enlarge the orifice into the antrum; and this is best effected by a naked trocar pushed up the socket of the extracted tooth: the trocar should be large, so as to break down a good deal of the floor of the antrum, thus making a free orifice for the discharge of matter. The absorption of bone which occurs around the fangs of carious teeth much facilitates piercing the antrum in this manner. Perforating the antrum occasionally requires considerable force; and it is necessary to apply this force with great care: the fore-finger should be extended on the shaft of the trocar as a guard, and the instrument should be pressed forwards with an even rotating motion. If these precautions are not taken, the floor of the antrum will sometimes give way suddenly, the trocar will traverse the cavity of the sinus, and strike hard against the floor of the orbit, which it may even pierce. I once saw this accident occur in the hands of a young operator, fortunately without any serious consequences. Occasionally antral abscess is associated with necrosis of some portion of the walls of the sinus; and if this should occur near its floor, the removal of the dead bone will supply an available orifice for the discharge of matter and the employment of injections. The presence of necrosed bone gives to the discharge the peculiar characteristic odour which is familiar to every surgeon: the offensive smell which the pus has, when simply long pent up, is a putridity of staleness, and quite distinct from the dead-bone fœtor. It may not be always easy to remove dead bone at once; and, in such a case, an outlet may be made in its neighbourhood, which will allow the discharge of the matter, and assist in the coming away of the sequestrum when it is detached. If a case were to occur in which the teeth have been long removed, and the alveolar processes absorbed, the floor of the antrum would be more difficult to pierce, on account of the thick compact layer of bone which is constituted by the *osteal cicatrix* after the removal of the teeth. In such a case it would be more easy to enter the antrum by perforating at the base of the malar process of the maxillary bone over the region formerly occupied by the second or third molar tooth. The mucous membrane should be divided first; and then the bone, when quite exposed, perforated by means of any instrument suitable for the purpose: a large trocar; or, as Sir B. Brodie suggests, a strong pair of scissors, closed and held firmly in the hand, should be *bored* into the part chosen for perforation.

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* *Practical Treatise on the Diseases of the Teeth*, by John Hunter, pp. 45, 46. 4to. London, 1771.

When the antrum has been perforated, the next step is to secure the complete washing out of the cavity by injections, and the free and continued egress of the discharge by the artificial opening. Warm water should be abundantly used at first, so as to remove all the matter, which is sometimes inspissated. This will give great relief, and the swelling and inflammation will usually subside at once. Should the tendency to pus-secretion continue, an injection of sulphate of zinc, or what in an obstinate case I found very efficacious, a solution (gr. ij. to the ounce) of nitrate of silver in distilled water, may be employed. I am in the habit of using a glass syringe with an ivory nozzle; fitted to the extremity of this is a bent silver tube. In using this apparatus, the silver tube is introduced into the opening in the antrum, and kept there while the syringe is filled and used; and withdrawn, refilled, and used again, many times. When the washing out of the antrum is completed, both the syringe and the silver tube are withdrawn; and now, unless some means are taken to prevent it, accidents of two kinds may occur;—first, food may pass through the orifice into the maxillary sinus; and secondly, the aperture, thus artificially made, may close and cicatrise over. To prevent this, the plan usually adopted has been, to plug the orifice with a piece of wood, which effectually prevents both ill consequences. This is, however, a clumsy method: the same and further advantages may be gained by adopting a plan which I have followed in some recent cases. After the perforation through the alveolar cavity has been made, I have taken a model, and a plate has been prepared to pass over the space occupied by the extracted tooth, and fastened to the contiguous teeth by the customary metallic bands. Through this plate a hole has been bored, which corresponds to the orifice into the antrum; and to the applied surface of the plate a very short tube has been soldered, sufficiently long just to enter the antrum, to occupy the perforation, and prevent its closure. This plate has been permanently fixed during the active treatment of the case, and the orifice in the tube has been kept closed by a plug of cork in the intervals between using the injection. By the removal of the cork, the nozzle of the syringe, which fitted the tube, could be applied, and the injection used any number of times, the tube being sufficiently short to allow the complete washing out of the cavity and the escape of the fluid. This plan of treatment has the additional advantage, that when there is no further need of keeping open the artificial orifice, the plate over the gum facilitates its closure. By removing the tube, and closing the hole by a little sheet of metal soldered on, the passage of air and fluid from the mouth to the antrum is suspended, and the healing of the wound is thereby facilitated, as will be hereafter explained. (See section on the Application of Obturators, &c.)

If in operations for antral abscess any foreign body, which may have caused or be associated with it, such as the fang of a tooth, becomes loose in the sinus, it should be remembered that the cavity is occasionally divided, as shown by M. Giraldès,[*] by partial septa of bone projecting from its walls. In such an instance, the adventitious body may be pocketed in a circumscribed region of the sinus,[†] and can only be removed by some curved scooping instrument introduced into the antrum; and this septate condition too would materially interfere with the cleansing of the cavity by means of injections.

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[*] *Des Maladies du Sinus maxillaire*, par M. Giraldès. Paris, 1851.

[†] An interesting example of this casualty is mentioned by Mr. Cattlin, in the *Transactions of the Odontological Society*, vol. ii. p. 38. London, 1861.

VII. *Dentigerous cysts.*—Dentigerous cysts are collections of serum, or some modification of serum, occurring in the maxillary bones, associated with and dependent upon impacted misplaced teeth.[*] These serous cysts may result from the presence of a supernumerary tooth or teeth; but in every case recorded, and in all except one that have come within my knowledge, the tooth or teeth have been normal in their presence and serial character, though misplaced as regards position: further, in every recorded case, the tooth or teeth thus implicated in disease, have been of the successional or permanent set, though a solitary instance has happened in the practice of a friend of the author's, in which a temporary tooth was the dental element of one of these cysts. These tooth-bearing serous tumours are, therefore, to be looked upon only as the occasional complications of dentition, in which there is an accidental deviation in the anatomical position of some tooth or teeth. The cysts only arise when the tooth or teeth associated with them are embedded in the substance of the jaw-bone; they do not occur after the tooth has pierced the gum. The embedding of a tooth in the bone does not necessarily give rise to these serous collections, for that is by no means an uncommon occurrence, whereas dentigerous cysts are rare. There appear to be three circumstances which may either of them produce impaction of a tooth in the substance of the maxillary bones: the tooth may be originally developed too deep in the body of the jaw, and thus, though it grow in a right direction and in a right position as regards the series, it will never reach the alveolar margin; or while it may be sufficiently superficial, it takes an oblique direction of growth, so that it lies covered more or less in the axis of the bone; or again, the position of the tooth and its line of growth may be originally normal, but from an arrest of the development of the fang it may fail to reach the alveolar edge, and so remain permanently impacted in the maxilla.* This may occur to any tooth, and has been recorded as affecting most of the permanent set; but it is more common with some than with others: it has been more often met with as regards the upper permanent canines than any other teeth. In cases where a successional tooth is impacted in the jaw, its temporary predecessor is usually retained considerably after the natural period of shedding. When a tooth is thus situated, its fang is enclosed in a bony socket lined by periosteum, as in ordinary circumstances, while the crown of the tooth is free in a little bony loculus lined by that which was the so-called 'enamel-pulp.' This structure is clothed with a sort of epithelium, which is apt to assume the function of secreting fluid. After the enamel is completely formed, the soft membrane which rests upon the surface of the crown of the tooth frequently separates from it, the interval being occupied by a sort of serum. This is generally the result of some irritation or difficulty in tooth-cutting; and where the irritation runs on to acute inflammation, as in some cases of tedious eruption of wisdom-teeth, the secretion may become purulent. In the deep-seated cases of impaction of teeth, the action is, I believe, always slow, and the secretion almost always serous.

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[*] The dentigerous cysts, to which I have above referred, are totally distinct in their origin and physiological meaning from those other tooth-bearing tumours which are found, some in the ovaries of females, and others variously distributed in the bodies of either sex. The dentigerous cysts occurring in the jaw are merely the result of misplacement of a tooth, or tooth-germs belonging to the jaw which contains them. The two other forms of dentigerous cyst neither belong to the individual in whom they are found, nor are they adventitious growths of disease, properly so called. They obviously represent a portion (more or less) of another individual, and indicate some curious aberration of the function of reproduction. The ovarian tumours which bear teeth, and many fœtal structures found in the ovary of the human female, I conceive to be the absolute equivalents of the virgin-produced 'zooids' of those invertebrata which perfect the function of *parthenogenesis* in the reproduction of their kind: that the development of these so-called tumours is the physiological equivalent of this function, though the anatomical result is incomplete. (See 'Ovarian Tumour containing Teeth,' &c., by the author, in *Guy's Hospital Reports*, 3rd series, vol. vi.) Those other tooth-bearing tumours which are found in various parts of the body, irrespective of sex, cannot be susceptible of the same explanation, but suggest the entanglement of an imperfect, or more or less perfect, ovum within the primary one. Teeth appear to be the most constant of the structures entering into the formation of these tumours; but they are associated with other tissues, even in more than one instance to the production of an entire fœtus. These developments receive a probable elucidation by those curious monstrosities occasionally noticed in the ova of birds, in which a small imperfect egg is found *within* a larger primary one—not the common monstrosity of *twin* yelks in one egg, but a distinct miniature egg *within* the larger. (See Retzius, in *Oefversigt af Kongl. Vetenskaps-Akademiens Förhandlingar*, Stockholm, 1847; Baron de Morogues, in *Revue de Zoologie*, 2^{e} série, tome v. Paris, 1853.) Such a circumstance occurring in the human ovum may explain the presence of these dentigerous and many-tissued cysts enclosed within the body.

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* 'On the Impaction of permanent Teeth in the substance of the Maxillary Bones,' by S. J. A. Salter, in *Guy's Hos. Rep.* vol. v. 3rd series.

The recorded instances of this condition are so few, that it is scarcely possible to generalise upon them: it may, however, be said that they have usually happened in young persons, at least have commenced in adolescence, shortly after, though sometimes before, the maturation of the impacted tooth. In the cases narrated, the upper grinders have been more frequently involved than other teeth, the serous cysts dilating into the maxillary sinus: but incisors, canines, premolars, and molars, have all been associated with this condition.

M. Jourdain * describes three cases of dentigerous cysts. The first case he records was that of a girl, seventeen years old, in whom the right upper first and second permanent molars were inverted, and a large serous cyst had expanded around them into the antrum, with great dilatation of the body of the bone, distortion of the side of the face, and closure of the nostril: it had existed 'some months.' In a second example, a man about sixty years of age suffered from a tumour the size of a pigeon's egg in his upper jaw, for many months, closing the nostril of that side; it was caused by the expansion of a cyst around the second premolar, which was impacted deep in the substance of the bone. The third instance occurred in a girl, thirteen years of age, from a monstrous permanent lateral incisor (side not stated) being embedded in the intermaxillary bone, above and behind the root of the central incisor; 'there was a considerable tumour, which occupied anteriorly the whole region of the maxillary hollow.' It had existed for a year.

Dupuytren † describes a specimen shown to him by M. Loir, in which a cyst was developed in the left superior maxilla: this cyst involved, and was dependent upon, the presence of the canine tooth in a reversed position.

I was informed of a case of this disease by my late colleague, Mr. Bransby Cooper, in which great swelling occurred in the substance of the superior maxilla of a young man, in whose mouth the first and second permanent molar teeth had never

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* *Traité des Maladies de la Bouche*, par M. Jourdain, tome i. pp. 119–125. Paris, 1778.

† *Leçons orales de Clinique chirur.*, Dupuytren, tome iii. p. 8. Paris, 1833.

made their appearance. A free opening was cut into the expansion, when the wanting teeth were found inverted in the axis of a serous cyst expanding into the antrum. No account of this case appears in Mr. B. Cooper's *Lectures on Surgery*, but I took memoranda of its particulars when communicated to him.

Mr. Wormald operated on a boy, about fourteen years of age, some time since, at St. Bartholomew's Hospital, in whom a serous cyst had expanded about the second bicuspid tooth of the lower jaw; the cyst was the size of a large chestnut, and was in the axis of the bone: the fang of the tooth was not fully developed. The interior of the cyst was lined with a thick vascular membrane, and it contained a glairy fluid. Mr. Wormald has favoured me with these particulars.

F. E. Glaswald published a very learned discourse on this malady, at the University of Greifswald, in 1844, containing a complete résumé of the literature of the subject.* The text, upon which this essay was elaborated, was a case that had been under the care and treatment of Prof. Baum. In this instance a cyst had dilated each antrum to an enormous extent, and with hideous disfigurement of feature. The patient was a woman, thirty-eight years of age, and the disease was said to have been in progressive existence for thirty years. From a cyst in the right antrum a canine tooth was removed, and from the left a molar. The fluid in the cysts was purulent.

Three instances of this condition have occurred in my own practice. In one a serous cyst expanded the left angle of the lower jaw in a young man twenty-two years of age, resulting from the impaction of the dens sapientiæ. The cyst was very large, and had been twice opened to allow the escape of the serum, which had in each instance rapidly re-collected. I extracted the second molar, which was loose: this ruptured the cyst, liberated the serum, and freed the impacted tooth; its crown appeared in the alveolus of the second molar, whose posterior fang was greatly absorbed by the progress of the cyst. The case was entirely cured by this means alone; and the dens sapientiæ gradually rose into the mouth in an oblique position. The second example is very interesting in a diagnostic point of view. A girl, eighteen years of age, had an elastic fluid-containing tumour in the substance of the incisive bone, extending up to the base of the nose on the left side. She had been seen by two or three surgeons; but the nature of the malady was not ascertained. She had the normal *number* of teeth in the jaw, though the *character* of one of them was abnormal for her age. When the patient was sent to me for my opinion, I perceived that the left central incisor was a *temporary* tooth; and this circumstance was a key to a correct diagnosis of the case. The left temporary central incisor occupied a position which its permanent successor should have held: the absence of the tooth, under such circumstances, suggested the almost inevitable position which it must occupy above and behind its temporary predecessor, that is in the axis of the serous cyst. The temporary tooth was removed, and the cyst explored, to discover the succeeding tooth. The permanent central incisor was found deep in the bone, in an upright and natural direction; its crown bare within the cyst; but upon its removal it was observed that the fang was aborted, and had only grown to one-fifth its natural length. This circumstance it was which had prevented its extruding its temporary predecessor, and establishing itself in its normal position. The retention of the tooth in its epithelioid sac furnished the anatomical grounds from which, under favouring circumstances of irritation, the serous secretion arose, and the bone-expansion followed. The third case was that of a gentleman about forty years of age. A cyst, the size of a pigeon's egg, had expanded around the second bicuspid on the left side, the tooth being impacted in the jaw. The fluid in the sac was thick, very dark yellow-coloured serum, containing a large quantity of cholesterine plates.

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* *De Tumore quodam utriusque Antri Highmori perversa dentium formatione exorto,* auctor Franciscus Edwardus Glaswald; Gryphiæ, 1844.

Pathological specimens of uncommon diseases, and those too not killing or shortening life, must necessarily be very rare. This applies to specimens illustrative of the disease we are considering. One is in the possession of Mr. Samuel Cartwright, jun., and is valuable and instructive in many points.* The preparation consists of a right superior maxilla—an adult bone: the teeth that remain, and the alveoli from which others have been extracted, show that the normal number of permanent teeth had developed in their natural position. The turbinated bones are gone, and the antrum maxillare is open. In the antrum, starting from its base, but not attached to its lateral which, however, is an exceedingly thin, delicate capsule of bone, and of the size of a chestnut, white with a granulated surface. The wall of the capsule contains nothing but one small supernumerary tooth, which is loose and free in the cavity. There are three important points in this specimen bearing on the anatomy and history of these cases:—the tooth is a supernumerary one: it is free and wholly detached in the cavity of the cyst: and further, the expansion is not that of the antral wall itself, with the tooth in it, [illegible] but a distension of that which was the bony covering of the contained tooth, which by its further distension would have expanded the antral wall, and probably have been confounded with it.

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* Through the kindness of my friend Mr. Cartwright, I have been allowed to figure this specimen. See *Guy's Hosp. Rep.* 3rd ser. vol. v. p. 328.

This latter circumstance appears to me to be of much anatomical interest in reference to those serious expansions of the antrum which are associated with inverted teeth. These have hitherto been described as cysts of the antrum itself: but I cannot conceive that a tooth being thrust through the mucous membrane of the antrum should produce such a result. The appearance of the crown of an inverted tooth in the nostril neither causes irritation nor increased secretion—at least no such consequence followed the three examples I have seen; and it seems to me to be far more probable that these cases have commenced as cysts within the bone at the base of the maxillary sinus, expanding into it, and ultimately filling its whole cavity and blending its walls.

Two specimens in the Museum at St. Bartholomew's Hospital throw some further light on the pathology of this condition. One preparation numbered 1. 119 exhibits a thin bony cyst, the size of a small Tangerine orange, with a thick membranous lining: it contained an inferior permanent canine tooth, *loosely attached* to its walls. It was removed from the lower jaw in the region of the contained tooth. The other preparation 1. 119a is the superior maxilla of a young sheep, in which the central incisor is attached to the side of a large cyst; the *fang* of the tooth being *almost wholly destitute of bony covering.* This denudation of the fang does not appear to exist in the early stages of these cases, but seems to be brought about by great expansion of the cyst, and the progressive absorption of bone which accompanies it.

In one instance only am I aware of a dentigerous cyst being associated with a *temporary* tooth. It occurred in the practice of my late friend Mr. Alexander Edwards of Edinburgh. The patient was a young man, in whose upper jaw, just below the orbit, a tumour had developed: the tumour consisted of exostosis from the maxilla, combined with a bony cyst, containing a tooth, which was pronounced by Prof. Goodsir to be a temporary molar: from a portion of the tooth, which I afterwards saw, it appeared to be the second, the larger of the two.*

The *symptoms* of a dentigerous cyst are almost wholly local, consisting of a general expansion of the jaw-bone at some particular spot; accompanied by a corresponding disfigurement of the neighbouring features, and a sense of weight and tension at the affected part. Where the impacted tooth has produced pressure upon a neighbour, the symptoms of pain and local distress have been more considerable, and have given rise to some constitutional irritation.

Upon manipulation the fingers readily perceive that the tumour is a central expansion of bone, and that it contains fluid; the bony walls yield to pressure, and then return to shape with that peculiar kind of crepitation which Jourdain characteristically calls *craquement*, like the doubling of stiff parchment; and the bone is usually sufficiently thin at some part to allow the production of fluctuation under the pressure of alternate fingers.

One of the most usual symptoms, and which is also an important *diagnostic sign*, is the absence from the mouth of some tooth or teeth which should have appeared, and have never been extracted. The presence of a fluid-containing tumour within the substance of a maxillary bone at the region of a tooth which is missing, and known always to have been wanting, would be well-nigh conclusive as to its being a dentigerous cyst, though the presence (or the past-known presence) of every mature tooth would not necessarily prove the reverse; for the dental element in the case may be a temporary or a supernumerary tooth.

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* Other examples of dentigerous cysts may be referred to:—'Tumour of the Upper Jaw depending on Cysts connected with the Presence of Teeth in a Preternatural Situation,' by James Syme, Esq., in *Edin. Med. and Surg. Journal*, vol. v. p. 381. Edin. 1838. 'Tumour formed by the Capsule of an uncut permanent Tooth,' by T. Wormald, Esq., *Lancet*, vol. i. p. 756, 1850. 'Dentigerous Cysts,' in Stanley's *Diseases of the Bones*, pl. xviii. p. 20 of Illustrations; London, 1849. 'Three cases of Dentigerous Cysts,' in Forget's *Des Anomalies dentaires*, &c., Obs. x. xi. xii. pp. 41–47; Paris, 1859. 'Case of Bony Dentigerous Cyst of the Lower Jaw,' by S. W. Fearn, in *Brit. Med. Journal*, No. 191, p. 241. 1864. Heath's *Injuries and Diseases of the Jaws*, p. 158; London, 1868.

However, an impacted temporary tooth is a very great rarity, and one producing a serous cyst still more uncommon: the same may be said of a supernumerary tooth. The diagnosis may be further advanced by exploring the cyst either by means of a grooved needle or trocar, when a serous discharge would support the idea of a tooth-cyst; and if the cavity be laid open, a probe will scarcely fail to discover the hard unyielding substance of the crown of the tooth.

The *treatment* of these cases is obvious, and usually quite efficacious. It consists in evacuating the contents of the cyst, extracting the tooth or teeth embedded in it, and where the expansion is large, in removing some of the dilated bone. The operations should be performed as early as possible, so as to prevent the necessity of cutting away much bone. and the prolonged and tedious absorption which would follow before the face or jaw assumes its natural form. All cutting should, if possible, be done within the mouth. Generally a portion of the wall of the cyst may be removed readily enough with a scalpel; but where the involved tooth is reversed, the expansion is likely to be away from the alveolar border. In that case bone-nippers, the extraction of contiguous teeth, or even the saw, may be necessary. This has been especially the case where inverted teeth have caused cysts in the antrum. The tooth is likely to be found at the base of the cyst, further, *i.e.*, from its thinnest expansion. Some difficulty may be found in getting hold of and removing the embedded tooth; but various long-bladed extracting forceps may be readily devised to suit any case if a difficulty should arise.

In some cases, from a persistence of the serous secretion, it has been found necessary to inject the cyst with astringent and stimulating injections.

The issue of these cases is, I believe, always satisfactory. I am not aware that it ever led to necrosis or other bone-disease. In one instance which I saw, a fibrous tumour grew from the cicatrix of the wound some months after the first operation: this was removed, and did not recur.

VIII. Alveolar and maxillary necrosis from (*a*) *Phosphorus fumes;* (*b*) *Eruptive fevers.*

The relation of the phosphorus poison to the disease in question, and its method of introduction, or rather application, are among the most distinctly proved of any of the circumstances connected with the history of disease. Probably there is nothing in pathological history where clear data, and simple induction from those data, have more lucidly illustrated the questions of cause and effect. To bring about the 'phosphorus disease,' phosphorus in some form must be applied to the periosteum, or, what is equivalent to the periosteum, to some raw vascular surface in immediate connection with the nutrition of bone; and the application must be prolonged, must be under particular circumstances of temperature, and probably of oxidation. These conditions alone occur in those manufactories where phosphorus is employed in the making of lucifer-matches; and there alone (or scarcely with exception) it is that this disease is manifested. But the circumstances which connect the outward cause with the disease that follows it, is a predisposition in the individual, consisting of some exposure of the periosteum, or what is tantamount to such exposure. The only manner in which this occurs, at least in which phosphorus appears to be effective in causing bone-necrosis, is where caries of a tooth exposes the pulp to the poison-influence, the bone-necrosis being that of the jaw. It is the poisoning of the tooth-pulp that is the essence of the disease; the severe combinations of bone-affection, which give all the importance to the malady, are but contingent and secondary consequences. It is this fact in the essential nature of the disease that links it (as I think) to that other form of maxillary necrosis which occurs in children after attacks of the eruptive fevers; only that, whereas in the phosphorus disease the poison is applied to the tooth from an extraneous source—from without—in the jaw-necrosis of eruptive fevers the poison is generated within, and alights upon the teeth and tooth-pulps, by virtue of their being dermal organs, members of the tegumentary system, upon which system generally the eruptive fever-poisons spend their chief destructive force.

Phosphorus disease.—The necrosis and exfoliation of portions of the jaw-bones, dependent on phosphorus fumes as its cause, is so entirely associated with the manufacture of lucifer-matches, that not only are all the particulars we know of the malady derived from the victims of that occupation, but the disease itself was not known to have an existence until some years after these light-producing agents had taken the place of the old tinder-box, and by the large demand for them had given rise to extensive laboratories for their production.

The earliest published account of the disease which we have is by Lorinser,[*] of the *Bezirks-Krankenhause Wieden*; and the first case which fell under his notice occurred in 1839, about eleven years after the opening of lucifer-match manufactories in Vienna. In this country, as far as I am aware, the malady was first recorded by Dr. Wilks, in 'Surgical Reports of Guy's Hospital,' from April 1846 to March 1847, where he remarks: 'Of the other diseases of the lower jaw, one occurred in a lucifer-match maker, with suppuration and exfoliation of bone.'[†] It is, however, to the continental surgeons, and those principally of Germany, that we are indebted for the complete and early account of this malady, from which all subsequent notices have been mainly derived. Besides the original memoir by Lorinser, before referred to, important contributions have been added by Strohl,[‡] Heyfelder,[§] Roussel and Gendrin,[||] Sédillot,[¶] Ebel,[**] and, above all, by Von Bibra and Geist,[††] whose exhaustive treatise, their joint production, has given the clearest elucidation of this new disease.

The most important article on this subject that has appeared in this country has been written by Dr. Bristowe, in the form of a Report to the Privy Council 'On the Relation of Phosphorus and its Manufactures to the Question of Public Health.'*

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[*] I have had no opportunity of consulting Lorinser's original writings: they are referred to by Geist as—'in den medicinischen Jahrbüchern des k.k. Oesterreichischen Staates, Jahrgang 1845, Märzheft.'

[†] *Guy's Hospital Reports*, 2nd series, vol. xii. p. 163. London, 1847. This case occurred in the hospital practice of the late Mr. Aston Key, who, as Dr. Wilks informs the author, was already aware, from his own observation, of the essential nature of the disease and its relation to its peculiar cause.

[‡] *Gazette médicale de Strasbourg*, cinquième année, No. 11, 20 novembre 1845.

[§] *Vierteljahrsschrift von Roser und Wunderlich*, Jahrgang 1845, Heft 3; and *Medicinische Zeitung des Vereins für Heilkunde in Preussen*, Jahrgang 1845. No. 45.

[||] *Recherches sur les Maladies des Ouvriers employés à la fabrication des Allumettes chimiques, etc.* Mémoire présenté à l'Académie des Sciences, le 16 février 1846.

[¶] *Comptes-rendus des séances de l'Académie royale des Sciences de Paris*, mars 1846.

[**] *Ueber den Einfluss der Phosphorzündholzfabrication auf die Gesundheit der Arbeiter.* Mitgetheilt von Dr. Ebel. In Casper's *Wochenschrift*, 15 März, 1851.

[††] *Die Krankheiten der Arbeiter in den Phosphorzündholzfabriken &c.* Erlangen, 1847; also *Die Regeneration des Unterkiefers nach totaler Necrose durch Phosphordämpfe*, von L. Geist, Erlangen, 1852. An admirable digest of this subject has been published, in the shape of a review of Von Bibra and Geist's work, in the *British and Foreign Medico-Chirurgical Review* for April 1848.

That the *cause* of the maxillary necrosis and exfoliation occurring among the artisans employed in making lucifer-matches is the fumes of the phosphorus, need not be discussed; the question has been already settled; and the reader is referred to the writings of the authors above named, especially Von Bibra and Geist, for the consideration of this point. The only question on this head which deserved serious inquiry arose from the fact, that the phosphorus employed was often impure, and contained a notable quantity of arsenic; and this Martius and Dupasquier considered might be the essential cause of the malady: but this supposition was not found to hold good under more critical and extended examination.† It is only when the cause has been long in operation, and under circumstances of great intensity, that the disease is developed; it is confined almost entirely to those who are employed in the process of *dipping* the matches into the fused and reeking phosphorus compound, and those who dry them in the same apartment. Moreover, a long exposure to the influence is necessary for the production of the disease. Lucifer-manufactories had existed eleven years in Vienna, when in 1839 Lorinser observed the first case which attracted attention; and the shortest known period in which the malady has developed itself was in an instance which occurred in Paris, and is recorded by Gendrin, in which the patient had been employed in the occupation two years before the first symptoms appeared. Another circumstance of curious import, though not invalidating the generally-received doctrine of local poisoning, is, that the sufferer may have been removed from the baneful influence for a considerable period, and nevertheless be subsequently attacked by the disease.

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* 'On the Manufactories in which Phosphorus is Produced or Employed,' in the *Fifth Report of the Medical Officer of the Privy Council*, p. 162. London, 1863. I may mention that my article on this subject in the first edition of this work was in type before the publication of Dr. Bristowe's Report, though from the delay in the issue of the fourth volume it did not appear till a year afterwards. But Dr. Bristowe was furnished with a copy of my paper, from which indeed he makes quotations.

† The actual agent in producing the phosphorus disease is doubtless oxidised phosphorus, probably in the form of phosphorous or phosphoric acid, dissolved in the saliva. The precise nature of the fumes is not exactly known; they consist principally of phosphorous acid (H_3PO_6), which by mixture with air becomes phosphoric acid (H_3PO_8); and probably minute quantities of phosphorus-vapour (P), phosphuretted hydrogen (H_3P), and hypophosphorous acid (H_3PO_4), are also present. Any vapour of phosphorus and hypophosphorous acid would be speedily converted by the air into phosphorous and phosphoric acids. Phosphuretted hydrogen would be more slowly oxidised into the same products. At any rate, nearly if not quite the whole of the fumes when inhaled by the work-people would be in a state of some acid of phosphorus capable of being fixed and neutralised by an alkali. Such being the case, it is greatly to be regretted that efficient sanitary measures are not adopted to prevent the disease, which surely might be done. The recommendations of Geist and Roussel amount simply to cleanliness and ventilation, and are not sufficient. I would suggest, that in all lucifer-match manufactories there should be a periodic and rigid scrutiny of the mouths of all the work-people employed. Those having faulty teeth should be excluded from the rooms (the *dipping* and *drying* rooms) where the obnoxious fumes are being developed. All carious teeth should be extracted or plugged. What is more important—a very simple and effectual respirator for the mouth might be worn by the employés; it would be unnecessary over the nostrils. It should be constructed on the ordinary plan of respirators, but its centre consisting of a porous diaphragm, such as sponge or some woven fabric, linen or cotton, which should be daily dipped in a solution of one of the fixed alkalies or their carbonates. This would arrest nearly, if not quite, all the acid fumes of the phosphorus. Or the respirator devised by

Strohl gives an instance of a girl who had worked as a *dipper* at a lucifer-match manufactory for five years; she left that employment, and adopted a totally different and healthy occupation, when, after three months, she was, for the first time, attacked with unmistakable symptoms of the phosphorus disease, ending after fifteen months, in exfoliation of portions of the superior maxilla.

It is very seldom that others than those employed in making lucifer-matches suffer from this malady; but that this may happen should not be lost sight of.

Pluskal[*] mentions an example of a little girl, seven years of age, who was in

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Mr. Graham for persons exposed to carbonic acid vapour would probably be as efficacious. It consists of the mixture in equal bulk of fresh-slacked lime and sulphate of soda, through a cushion of which it is easy to breathe. The wearing of some such respirator should be compulsory with the dippers and dryers. Again, the acid vapour might be neutralised and rendered innocuous by keeping the atmosphere of the apartment ammonuretted. I believe, if these precautions were adopted, the disease would seldom, if ever, manifest itself.

There is a curious modification of phosphorus, known as 'amorphous' phosphorus, which does not emit noxious fumes when heated sufficiently for its employment in match-making. This kind, however, is not mixed with chlorate of potass (which furnishes the oxygen) for tipping the matches, but is employed to coat the rubber on the surface of the box against which, by friction, the chlorate of potass match is ignited. These matches deserve universal adoption; for not only are they made without possible injury to the work-people; but they are quite safe, being incapable of accidental ignition.

[*] *Oesterreichische medicinische Wochenschrift*, No. 30. Wien, den 25 Juli 1846.

the constant habit of playing with matches, standing before a wall and discharging them in the dark for amusement, so that her face was bathed in their fumes; in time she was attacked with necrosis and exfoliation of small portions of the front of the lower jaw, with the ordinary attendant symptoms. Simon narrates a case in which the disease appears to have been brought on by a person chewing pieces of ginger, which he kept in his pocket with some lucifer-matches. And Mr. Paget describes[*] a case in which the malady was induced by the manufacture of medicines in which phosphorus was employed.

The influence of the phosphorus fumes upon the jaw is undoubtedly local. Lorinser, who has the merit of discovering this disease, held a different opinion; but Roussel, Geist, and indeed subsequent writers generally, have adopted the opinion, which all the evidence upon this point seems clearly to establish.[†] I have not space here to enter upon the argument of the question; I may, however, mention one telling fact; it is, the necessity of dental caries in the individual before the disease can be produced. It has never been known to occur, excepting where the sufferer has had carious teeth; and many persons have worked in the manufactories for a long series of years with perfect impunity, who, upon the supervention of dental caries, have been attacked with the malady. Dental caries, by opening the central chamber of the tooth and exposing the pulp, seems to offer a tolerably direct channel for the poison to be communicated to the subjacent periosteum, and this, no doubt, is why tooth-destruction is a necessary pre-existing condition. What the precise nature of the action of phosphorus-oxide thus absorbed may be upon the bone, is a matter of speculation; but the particular nature of the poison, entering as it does so largely into the composition of the skeleton, is a suggestive circumstance: perhaps, if accumulated by the periosteum, it may generate on the bone's surface a condition of chemical *superphosphate*, inconsistent with osteal vitality.

The *symptoms* of phosphorus-necrosis do not differ essentially from other forms of necrosis in the same parts: they are, however, not infrequently accompanied by bronchial and pulmonary irritation from inhalation of the fumes: this has been especially pointed out by Sédillot, Gendrin, and Dupasquier.[‡] And one of the patients whom I have seen, affected with this malady, has detailed to me symptoms of *spasmodic asthma* which occasionally supervened when he was employed for many continuous hours '*dipping*' while suffering from a common 'cold' in winter weather. Barring this occasional manifestation of pulmonary irritation, the general health of these work-people is remarkably good.

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[*] *Medical Times and Gazette*, vol. i. p. 41, 1862.

[†] The arguments bearing upon this question, and the conclusive inference to which they lead, are stated with cogent force in an admirable clinical lecture on this subject by Mr. Simon, in the *Lancet* for 1850, p. 41.

[‡] *Gaz. méd. de Paris*, 1846, No. 49.

The symptoms of the jaw disease usually commence with what is supposed to be toothache, the pain being at first pretty much localised to some one tooth that is carious, and which is probably the channel by which the poison is introduced. The advance of the disease is generally slow at first, and, as it were, undecided—indeed, indefinitely chronic; the pain is inconstant, and not early attended with more serious symptoms; presently, however, it becomes more severe and erratic, extending vaguely about the side of the head and down towards the shoulder, and with this severer pain swelling and extreme tenderness occur; the integument near the affected region becomes red, tense, and distended, while the teeth feel elongated and intensely painful when brought in contact with their fellows of the opposite jaw, and they become very loose. The gums are swollen and livid, and this condition extends to the mucous membrane of the cheek. All these symptoms increase till suppuration is established, and with them, more or less, symptomatic fever is developed in proportion to the severity and extent of the disease: the patient has rigors and pyrexia, and is often thoroughly ill. The point at which the pus finds its discharge varies a good deal: the soft parts first become very boggy, especially the gums, and matter often escapes early around the necks of the loose dead teeth; when pointing externally, its approach is accompanied by intense glistening erysipelas-like redness of the integument. The discharge of the pus is attended with great mitigation of the patient's suffering. The pus itself is often sanious at first, and very fetid, having the odour characteristic of the presence of necrosed bone. The orifice of discharge frequently leads to long burrowing sinuses, especially where the lower jaw is affected; and through these the dead bone may be detected by a probe. The swelling which attends the disease is often very great, particularly when the lower jaw is necrosed: it is diffuse and wide-spread, encasing the external and under surface of the bone in a prodigious, dense, plastic exudation. In very severe cases, previous to the discharge of pus, while the inflammatory symptoms are at their extreme height, the whole head, except the summit of the scalp, is involved—the eyes are closed; the nose, and even the forehead, swollen; the cheeks, lips, neck, and throat, are one continuous area of florid intumescence. It is a curious circumstance that in the lower jaw the necrosis is attended with a very large and complete development of ossifying callus, whereas none is formed when the upper jaw is affected. The large plastic exudation which surrounds the base of the lower jaw becomes converted into a mass of supplemental bone, supporting the sequestrum, which is, for the most part, naked and bare within and behind, and connecting sound portions of bone at its extremities when the whole of the maxillary arch is not involved. Geist assumes that the particular region occupied by the osteophytic incrustation about the lower jaw is the result of gravitation—an idea altogether too mechanical: it is rather to be looked upon as a physiological manifestation, and one element in that marvellous exhibition of the *vis medicatrix naturæ* which this repair of the lower jaw displays: the supplemental bone thus placed forms the best support for the sequestrum, and the least interferes with the functions of the mouth; while the absence of an ossifying callus at the upper and inner region of the maxillary arch offers the readiest escape of the dead bone through the thin mucous membrane which there alone covers it, and this without damaging the integument of the face.

As the bone becomes laid bare by the ulceration of the soft parts, it is observed bathed in ichorous pus, ragged and irregular in its surface, and of a dirty blackish grey colour: this latter condition is said to be invariable, as though characteristic; but it is not so, for although very general, I have seen specimens white and clean, and with the compact external layer of bone intact.

To return to the symptoms of the disease. When the extent of necrosis is very great, the constitutional disturbance is correspondingly severe; and in the early stages of the malady the patient may have intense fever, with delirium and agonising local suffering, the more distressing from the region which the affection occupies—interfering with or altogether suspending the action of the mouth, and, by the secretion of foul and fetid pus, producing nausea, ructus, vomiting. The looseness and projection of the dead teeth is another source of annoyance and distress: as the sequestra containing them emerge from the surrounding parts, their elongation and angularity much irritate the gums and cheek in contact with them. In the severest cases, general sphacelus of the soft parts about the jaw, with œdema of the face and neck, may supervene, accompanied, or not, by erysipelas; and death may then close a scene of terrible suffering. In other instances with a fatal issue, life is drawn out through many months of tedious illness, varied by different degrees of local irritation; till at length the patient, with vital endurance inadequate to the requirements of the disease, sinks, tabid and exhausted, under continuous hectic, and not infrequently with tubercular complications.

But the pathological changes may be more terrible than those already mentioned.

Dr. Ebel describes a case which occurred in the practice of Dr. Hervieux at the Hospital *Necker*, in which the patient, a lucifer-match maker, first had necrosis of the lower jaw, then of the upper, afterwards of the palate bones and the orbits, and lastly of the os frontis. He died with brain symptoms. Pus was found between the dura mater and the brain.

When the malady progresses to a favourable issue, which it does in the majority of cases, the dead bone gradually loosens and becomes detached; and this is generally anticipated by the falling out of some of the necrosed teeth. In the upper jaw the sequestra are usually more broken up and smaller than in the lower, and they are shed easier, not being held in and detained by ossifying callus, which is always wanting in the upper jaw. In the lower jaw the sequestra are usually more extensive, often including large portions of the body of the bone, not infrequently the ascending rami, and sometimes the coronoid processes, and even the articular condyles. The shedding of these sequestra is often hindered by the large surrounding ossifying callus which always forms when the lower jaw is the subject of this disease.

I may here mention that some stress has been laid upon the circumstance that the lower jaw has been more frequently observed to be affected than the upper. The learned reviewer* of Geist and Von Bibra's work has given much detail bearing on this point; he enumerates twenty-five examples in which the lower jaw was affected, to twenty-one in which it was confined to the upper jaw. In five cases which I have seen, the lower jaw was diseased in four, and the upper in one; whereas four, which occurred in the practice of a surgical friend, were confined to the upper jaw. In seventeen instances of which I have obtained particulars or seen specimens, nine were connected with the superior, and eight with the inferior maxilla. Dr. Bristowe in his investigations, met with evidence of thirty-nine cases in the lower jaw, twelve in the upper, and five in both.

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* *British and Foreign Med.-Chir. Review,* before cited.

The results of phosphorus-necrosis, in cases which get well, are very various. As regards general health, the patient usually recovers with an elastic convalescence after the dead bone has been removed; but the physical condition of his maxillary apparatus is often terribly mutilated. When the front part of the upper jaw is affected, it is an absolute and unrepaired loss, miserably disfiguring the patient, altering the physiognomy most painfully; when it affects more hidden parts of the jaw, the loss is not less complete, though less conspicuous.

If the affection is confined to the inferior maxilla, the removal of the sequestrum leaves a supplemental bony representative, which, for a time, more than makes up for the loss of dead bone, and for a long subsequent period efficiently performs the office of edentulous mastication, and supplies the wants of personal comeliness.

In some instances the whole of the lower jaw has been lost, excepting the articular condyles; and these, apparently connected with the new bone, have established the joint requirements of the supplemental jaw; but in other instances (cases in St. Bartholomew's Hospital, and those mentioned in Geist's later work*) even the articular ends have been shed with the rest of the sequestrum; still there has been joint movement, doubtless from a ligamentous attachment of the new bone.

This repair of the lower jaw is, however, generally but temporary: for after a time—often a considerable time—the new bone diminishes, by absorption, to a mere narrow arch, and ultimately, there is scarcely enough bone to keep out the lower lip, and the chin is utterly lost. I have had an opportunity of examining this state of parts after the lower jaw had been removed ten years. Dr. Bristowe, however, mentions two instances, one after six, and one after ten years, in which the supplementary bone remained large and well formed: but he describes another in which, after eight years, the new jaw was scarcely bigger than the hyoid bone. How far the loss by absorption of supplemental bone, may be prevented by supplying it with a function, through the means of artificial teeth, is a question of theoretical interest and of practical importance.

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* *Die Regeneration des Unterkiefers nach totaler Necrose*, v. L. Geist, 1852.

The *treatment* of phosphorus-necrosis of the maxillæ divides itself into that which is common to all bone-necrosis, and that which specially applies to the particular local affection in question. Upon the latter head alone I would remark.

In the early stages of the disease, when as yet it is not established, but its supervention feared, it would be of the last importance to remove the patient from the cause of the malady: pure air should be sought, abundant cleanliness, with urinary and alvine excretants, resorted to, and all suspicious teeth extracted. When, however, the local symptoms—extreme pain, swelling, and indurated infiltration of the soft parts—develop themselves, and the disease has already passed its premonitory stage, it will be advisable to have recourse to more active measures. Upon this point I cannot do better than quote Mr. Simon's remarks in his admirable Clinical Lecture, already referred to, and in the justice and propriety of which I entirely concur: 'So soon as the second or inflammatory stage of the disease has thoroughly set in, the bone seems in every case to be irrevocably doomed to necrosis; and I would therefore recommend you, in the event of your being called to a case at the transition period between the two stages, when hypertrophy is passing into inflammation, to adopt without hesitation the most active measures for the relief of the periosteum and bone. Leeches and general antiphlogistic treatment *may* do good; but the consideration of the pathology of this disease, together with the analogy of other periosteal affections, leads me to believe that the only real chance of doing good would lie in still more energetic measures; and I would recommend you in any such instance, to make with your scalpel free vertical incisions through the gum wherever tenderness and swelling exist; extending your line of cut upwards in the upper jaw, or downwards in the lower, as far as the structure of the parts will allow, bringing your incisions as near together as circumstances may require, and in every point carrying them clearly down to the bone, so as to afford the utmost relief and relaxation to the overloaded and tense periosteum. I believe that this method of procedure would be the nearest approach to an effective one for checking the inflammatory stage of the disease before it has reached an intensity which must inevitably destroy the jaw.'

When the stage of threatening has past, the extent of the inflammatory mischief appears to assert itself at once—the whole of that portion of bone which is subsequently the sequestrum appears to be stricken from the first. Prevention is at an end, and palliation rather than cure is indicated as the surgeon's mission. When pus has formed, it should be early conducted to the surface, and by judicious interference external scars may often be prevented by means of well-directed punctures within the mouth. The whole of the teeth implanted in the dead bone become loose, and apparently elongated; their doom is already sealed, and they should be extracted without delay, as they cause much irritation to the tongue and cheeks.

When the discharge has established itself, and the fetid pus is pouring from the sinuses that communicate with the dead bone, abundant rinsing of the mouth should be had recourse to, not only in the form of mere washes with water to remove the filthy secretions, but astringent and deodorising lotions, such as decoction of cinchona, and solution of alum, solution of chloride of lime, and, still better, solution of permanganate of potass. As has been pointed out by Mr. Simon, the unhappy patients are sometimes so disabled as to be incapable of gargling out their mouths, and then little pieces of sponge may be used by them to wipe away the stinking discharges.

As regards the sequestra little can be done. Sharp projecting pieces of bone may be cut off by nippers; but the bulk of the dead bone must take its own time to be shed—often a very long time. It is a period of miserable suffering to the patient, and terrible constitutional exhaustion; but it cannot be shortened or its results anticipated.

In March 1862, I saw in the London Hospital, under the care of Mr. Adams, a patient who had been suffering from the disease, affecting the entire inferior maxilla; it had been going on two years and a half; the latter four-fifths of the time with the lower jaw, except probably the articular ends, dead and lying in the mouth, bare and ghastly, bathed in ichorous pus within its huge supplemental successor.*

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* The necrosed jaw was afterwards removed. The operation and its sequence were both unusual. The patient was placed in a kneeling posture, with the chin on a table, and, the mouth being open, the symphysis of the jaw was split down by a chisel and mallet. The right half of the bone was then seized by large strong forceps, and wrenched from the mouth with great force. After a

The sequestra of the superior maxilla are apt to be more detached than those of the inferior—divisible and smaller, and they can be brought away piecemeal; moreover, as the upper jaw is an attached, and not like the lower, a floating bone (with muscles ready to displace its parts when the integrity of its arch is broken), its dead portions can be removed without jeopardising the relations of the rest of the bone. Therefore a little and early surgical interference may be employed without injury, and parts brought away which if belonging to the lower jaw, had better not be interfered with. In the lower jaw the disease is usually so much more comprehensive, and its resultant sequestrum is so solid, that patient watching and palliative treatment are all that can be adopted generally till the very close of the case. Earlier interference might disturb the relations of the supplemental bone (the *natural splint*) and the portions of jaw still living, and by allowing the strong antagonistic action of the muscles attached to the two halves of the latter to act separately, lead to the permanent displacement of the elements of the maxillary arch. The articular ends of the bone often—indeed, in the majority of cases, though not always—escape the necrosis, when the whole of the rest of the bone may be destroyed; and this circumstance suggests an element of treatment which may much shorten the patient's suffering. When the necrosis has evidently passed up to the neck of the condyles, the bone may be removed by sawing or nipping across the neck as high up as possible (on either side, if both sides are affected), and then dividing the body of the jaw at its symphysis; the two halves of the bone may be withdrawn, one by one, without any external wound. Should the condyles be necrosed and follow, no harm will have been done by the previous operation, and the patient's suffering will have been much diminished and curtailed. The division of the bone may be accomplished by a Hey's saw, or some modification of it improvised to suit the particular position of the required line of section. Variously curved bone-nippers may also be devised to

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week the same course was adopted with the left half; but this required still greater traction. The entire bone was thus brought away, including the condyles. Ten days after the first operation the patient was seized with secondary hæmorrhage, profuse and arterial, on the *right* side from the wound, where the first portion of jaw was removed. This necessitated ligature of the right common carotid artery. The latter operation was performed by Mr. Maunder, and the patient recovered perfectly. See *Med. Times and Gazette*, July 5, 1862.

accomplish the same objects. The extreme and firm closure of the mouth sometimes renders this operation very difficult.

I need not dwell upon the general treatment of these cases as far as they are in common with those of bone-necrosis generally. The particular region affected, however, involving and disabling, as it does, the masticatory function, entails some modifications. In the long tedium of their course every effort should be made to supply, by suitable food, the deficiencies which suspended mastication entails—mashed meat, eggs, cod-liver oil, and such sustainants, should be abundantly employed; and iron salts, in moderate proportion, should, if bearable by the patient, be almost a matter of daily diet rather than an occasional medicine.

There is one point which I would allude to—more a matter of pathological curiosity, than having any other bearing; it is the enormous amount of pus which these patients daily swallow and (apparently) digest. It must be many ounces, and this without any obvious detriment to health; the patient's condition being no worse than may be accounted for by the force of the local symptoms.

Exanthematous jaw-necrosis.—I believe that the necrosis and exfoliation of the alveolar processes and portions of the jaws in children, consequent upon the eruptive fevers, is essentially the same as the maxillary necrosis in the victims of phosphorus fumes, and that it is the result of the local application of a specific poison to the vascular parts of teeth. There is this difference, however, that in the cases we are now considering the poison is generated within the individual, but with affinities for certain structures and tendencies to action upon certain organs which give its morbid consequences an equally local character. Whatever opinions may be entertained as to the homological relations of the several tissues of the teeth to those of the general integument, there can be no question as to their being members of the dermal system, and as such we should *à priori* expect that they would share the consequences which attend those particular diseases which spend their chief force on the skin. There is one circumstance, however, that modifies such an anticipation; it is the low state of vitality of the teeth, and the extremely slight nutritional changes which occur in them *when once they are formed*, and which must consequently remove them to a great extent from those transient though potent influences which would destroy or morbidly affect vascular or rapid-growing tissues. But such a qualification does not apply to the conditions of the teeth during their development. From the time of birth till the eighth or ninth year, the jaw-bones are the seat of intense developmental nutrition in the formation of the teeth, and are among the most vascular parts of the body: about the middle of the period named, five years of age, the maxillæ contain no less than forty-eight developed teeth and developing tooth-germs. It is about this time that the poison of the exanthematous fevers appears to exert its most deadly influence on the dental system.

The form of necrosis affecting the alveolar edges of the maxillæ, and accompanied by the shedding of the teeth, which we are now considering, was, I believe, first recognised by myself* as one of the sequelæ of the exanthemata, and dependent necessarily on their previous occurrence. Many isolated cases of the affection have been described, and our museums contain specimens of the sequestra; but the supposed relation of cause and effect had not, so far as I know, been expressed before.†

This affection is by no means common, considering the almost universal occurrence of the eruptive fevers. The very large population tributary to Guy's Hospital has only furnished me with twenty-three or twenty-four cases during the last nine years; and I have reason to think that even in this I have been disproportionately favoured.

The cases are all singularly alike. A little child has just recovered from one of the eruptive fevers, most probably scarlatina; the case has been in no way unusual as to its severity or its course: within six weeks or two months of the passing off of the acute symptoms, tenderness of the mouth is complained of, and the mother notices fœtor of the breath. Upon inspecting the mouth, the gum is seen to be peeling from the edge of the jaw around the neck or necks of some temporary tooth or teeth; pus is discharging, and more or less dead bone is exposed. The nudation of the bone progresses rather quickly in depth, but ually not after the first in lateral extent; the temporary eth at the affected part become loose, and often fall out. here is no swelling: and no ossifying callus is formed in the gion of the necrosed bone. In a few weeks from the first of ese symptoms, the sequestrum itself becomes loose, and is sily removed, leaving a large gap, and a raw granulating rface, which rapidly heals. The necrosis almost always cludes the bone which constitutes the loculi containing the veloping permanent teeth, as well as the alveoli of the temporary; but it does not go further, and in the lower jaw the base the bone is very rarely affected. I have never seen such an currence. The disease is frequently symmetrical: when atcking the bone about the temporary molars on one side of e jaw (its most common situation) it often manifests itself nmediately after on the opposite side, and sometimes in the me regions of the other jaw. The same symmetry is observed the front of the mouth.

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* 'On the Shedding of the Teeth, and Exfoliation of the Alveolar Processes consequent upon the Eruptive Fevers,' by S. J. A. Salter, *Guy's Hospital Reports*, 3rd series, vol. iv. Several specimens of sequestra from these cases have been figured by the author in the *Transactions of the Pathological Society*, vol. xi. pp. 209–215.

† The earliest recorded cases are mentioned by Fox in his *History and Treatment of the Diseases of the Teeth*, p. 112. London, 1806. These cases, two in number, occurred after small-pox.

As far as I am aware, this affection only occurs after the ruptive fevers,* and scarlatina is its most potent cause. In he instances which have been under my own care, two were fter small-pox, five or six after measles, and fifteen or sixteen fter scarlet fever. There is, however, nothing in the condition of the mouth to indicate which has been the precursor. The ge at which this affection occurs is usually about five years: from three to eight are the extreme limits I have known.

The issue of these cases is simply comprised in the loss of a certain amount of bone with the contained teeth, and the consequent disfigurement. As the permanent teeth are lost with the temporary, the disfigurement is very great when it affects the incisors; but when the temporary molars and their successors, the bicuspids, suffer, the damage is comparatively slight. I have seen two examples of adults where this has happened in childhood, and the alteration of the face has been wonderfully little: the first molar approaches very close to the canine, and the second and third molars come well forward into the mouth, filling out the cheeks, and exhibiting no external evidence of what has occurred. In one solitary instance which I saw, in which the permanent tooth was not shed at the time when the bone and temporary tooth were lost, it was in effect equally destroyed, for the tooth was blighted—it did not grow after that time; no fang was formed, and when cut it remained a mere tooth-crown, loosely attached to the surface of the gum.

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* I have heard of one doubtful case after continued fever (typhus or yphoid); but this would form no real exception to these cases or their athological interpretation. The continued fevers have their specific cutaeous eruptions; and their damaging influence on the tegumentary system sufficiently attested by the falling of the hair in convalescents from them. I would not, however, be supposed to deny that jaw-necrosis, associated or not with death and exfoliation of other bones, may occur in children as the esult only of extreme cachexia or depressed vital nutrition. Such instances are eferred to in vol. iii. p. 762. I merely wish to assert my belief that the paricular form of alveolar necrosis above described is one of the *specific sequelæ* f the eruptive fevers, and is related to its cause in the manner indicated in the revious pages.

The *treatment* of these cases involves little beyond patience and cleanliness. No operative interference is indicated; the extent of the necrosis asserts itself from the first, and cannot be curtailed. Soon the sequestrum becomes loose, and may then be readily removed by dressing-forceps. I would suggest a weak solution of *permanganate of potass*, as a cleansing and deodorising mouth-wash. Any general symptoms of disturbed health should be met on ordinary principles. Where the suppuration is profuse, and the bone-necrosis extensive, stimulants and tonics may be required; and in the scarlet-fever cases steel would be a useful adjunct; but I would observe, that in the cases I have seen, the children were, for convalescents, in remarkably good health, and had, almost without exception, escaped the other ill consequences of the eruptive fevers.

IX. *Hæmorrhage after extraction of teeth.*—Long-continued and obstinate bleeding after the extraction of teeth is an occasional and troublesome complication of this operation. It is not a common consequence: indeed it is very rare, considering the enormous numbers of the operations, and how seldom in proportion continued bleeding follows them. The troublesome hæmorrhage from the wound of an extracted tooth is of a peculiar character: it is not a rapid arterial discharge immediately following the vascular rupture which the tooth-extraction causes, but a continuous, abundant flow of blood welling-up in the empty socket, and developing itself into a serious and sometimes alarming symptom, usually many hours after the operation. The profuse pouring-out of vivid arterial blood, which sometimes follows the drawing of a tooth, has no relation o the circumstance we are considering; that generally lasts ut for a few minutes, and then ceases. The continued hæ- iorrhage is not the discharge of any considerable arterial runk that may have been wounded, as has been supposed, but ie passive bleeding, as it seems, of the entire disrupted surface, rom an inability of the vessels to accomplish the curative losure of their broken ends. In the majority of the recorded ases there has been distinct evidence of the existence of the æmorrhagic diathesis in the individual affected; and in not a ew, the patients have themselves been aware of the tendency, rom having experienced similar consequences attendant on the revious extraction of other teeth. Indeed, some persons (I ave some such patients of my own) refuse to have any more eeth removed, preferring rather to suffer any amount of tooth-ache, on account of the alarming hæmorrhages which have followed the operations before.

In one case which came under my treatment, there was no history of a hæmorrhagic tendency; but the patient was a young lady, and the circumstance occurred just as menstruation was imminent. The bleeding was very considerable, and continued for two days, when under the influence of emmenagogues (hot hip-baths and aloetic purgatives), the catamenia appeared, and the hæmorrhage from the alveolus immediately ceased. In this case, doubtless, the bleeding was a vicarious manifestation of the periodic function. A very interesting example of this distressing consequence of tooth-drawing, showing its constitutional nature, was under my care some years since. A clergyman from one of the midland counties came to town to me on account of the hæmorrhage which had followed the extraction of a lower molar tooth three or four days before and was still continuing. He was reduced to a pitiable condition of exhaustion and bloodlessness. All the local means usually adopted had been tried, but without success: the bleeding, however, speedily ceased under the use of large and frequently-repeated doses of *tannin*. The history of this gentleman and his family is curious and instructive. As a boy, from the most trivial accidents, such as a cut finger, he sustained prolonged and almost irrepressible bleeding: during his whole life, the slightest blow or bruise would cause a large and very disproportioned ecchymosis; a few years before, he had sustained a week of hæmorrhage, after the extraction of a tooth. This gentleman has three married sisters, all of whom suffer from terrible floodings at the birth of each child. He has a little boy, as liable to bleeding from a trivial wound as he was in his childhood.

It is of special importance to bear in mind the general and diathetic nature of alveolar hæmorrhage, in devising its proper treatment. Anything which would increase the wound, or add a fresh one (such as the cautery or the ligature of an arterial trunk), is contra-indicated.

A fatal example of alveolar hæmorrhage, in which both these means were adopted, is recorded in an early number of the *Medico-Chirurgical Transacti* The previous history of this patient is singularly like that of the clergym whose case I have just mentioned, in the hæmorrhagic diathesis manifesti itself in childhood, and his having sustained a terrible loss of blood—the blee ing lasting for twenty-one days—when another tooth was extracted bef In the treatment of this fatal hæmorrhage, the actual cautery produced onl temporary arrest of bleeding: it was then determined to tie the carotid arte the operation was performed by Sir B. Brodie, without any relief to the origi symptoms: the wound in the neck only furnished another bleeding suff and evidently hurried on the fatal catastrophe. In another recorded case wh the cautery was used, the edge of the lip was accidentally burnt, and surface thus cauterised soon commenced bleeding profusely, and contin to do so till the fatal termination of the case, which was hastened by it.

The *treatment* of this form of hæmorrhage divides itself i local and general; the local treatment consisting in the ap cation of styptics, with continuous pressure upon the blee surface; the general treatment, in the rapid and abund administration of internal astringents. The local plan of plugging compress, recommended by Hunter, is that n universally adopted: 'In general it will be sufficient to stuff socket with lint, or lint dipped in oil of turpentine, and to ap a compress of lint, or a piece of cork thicker than the bodie the adjacent teeth, so that the teeth in the opposite jaw may b up a pressure. It has been advised to stuff into the socket so soft wax, on a supposition that it would mould itself to the cav and so stop the bleeding: this, perhaps, may sometimes ans better than the other method, and therefore should be tried wh that fails.'† The restoration of the extracted tooth to the soc has also been tried with success. For the purpose of formin plug of lint, a strip should be cut of an elongated wedge-sha and this should be introduced, the pointed end first; the tremity should be introduced into the bleeding socket, a driven well home to the bottom; the strip of lint should th be folded and re-folded upon itself, so as to make the plug ve solid and pressing on the entire superficies of the socket. Wh the compress of lint or cork has been applied, the mouth shou be closed and the jaws kept permanently together, so as to ex considerable and persistent pressure by means of a broad banda tied under the chin and over the head. Where the opposi teeth in the other jaw are wanting, it may be difficult to keep up the compress-pressure by the mere closure of an edentulous jaw upon the bleeding alveolus. Mr. Higginbottom of Nottingham was, I believe, the first to invent what he called an *alveolar tourniquet.*[*] It is an instrument consisting of two blades, or shafts, united at one end, and capable of approximation and compression by means of a screw, and free at the other extremities; these latter are armed with pads, one applying to the compress in the mouth, and the other to the exterior: where the bleeding is in the lower jaw, the blades are nearly equal, the exterior one simply passing under the base of the horizontal ramus: for the upper jaw the instrument is less applicable, and the outer blade requires a long curved sweep, so as to grasp the top of the head. Various local astringents have been recommended in conjunction with the lint-plug: matico has been highly spoken of: I have found an alcoholic saturated solution of tannin answer the purpose very well; but probably the old remedy, turpentine, has never really been superseded.

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* 'A Case of Fatal Hæmorrhage from Extraction of a Tooth,' by Rich Blagden, *Med.-Chir. Trans.* vol. viii. 1820.

† *A Practical Treatise on the Diseases of the Teeth*, by John Hunter, p. London, 1778.

I am convinced, however, that it is a great mistake only to treat these cases topically: they are most obviously manifestations of constitutional vice, and require a corresponding general treatment. Astringents should be had recourse to at the earliest stage; they can do no harm, and may be suspended at any time, while in the majority of cases they will be most beneficial. These cases often extend over so long a period that constitutional treatment has abundant time to be brought into full operation. Tannin and turpentine have been the most successful of internal remedies in recorded cases; with the latter drug, steel might be advantageously combined, especially in the form of the muriate tincture. In the irritability of sanguineous exhaustion, opiates may become necessary in large doses.

Other circumstances require attention: the patient should occupy a cool apartment, and local icy applications may be beneficial. The upright posture is to be preferred: or if the patient goes to bed, he should be bolstered up in as elevated a position as possible, while the circulation in the lower extremities should be encouraged.

In women during the menstruating period of life, it should not be forgotten that the hæmorrhage may be associated with suppressed menstruation, and constitute a vicarious discharge; and remedies should be adopted to meet this contingency.*

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[*] 'On Arrest of Bleeding after Extraction of Teeth,' by J. Higginbottom, F.R.S., *Prov. Journ.* vol. iv. 1842.

X. *The application of obturators and false palates in cleft palate, &c.*—The title of this section is scarcely in keeping with the heading of my essay—'Surgical Diseases connected with the Teeth,' &c. The maladies which give rise to perforations and clefts of the palate are, practically speaking, very seldom dependent on diseases of the teeth; but the particular region of their resultant defects, and the nature of the mechanical dentist's art, as remedying those defects, bring this matter fairly within my province.

The two forms of cleft or perforate palate, congenital and induced, are very unequally suited to this particular plan of treatment: a large number of the former may be radically cured by means of surgical operation, which is always preferable where practicable; in the latter cases, the mechanical assistance of obturators is of more avail, and, in many instances, not only removes an existing defect for the time being, but is to a great extent curative.

In congenital cases, when *very* severe, this is the only method applicable for the treatment of the great physical defect, no operation being capable of bringing into apposition the separate masses on either side of the cleft, or of remedying the defect of soft parts, which consequently require to be supplied by new and foreign material.

When the cleft or perforation consists of an aperture in the hard palate only, as in most syphilitic and scrofulous cases, and some congenital, an arch of metal or other hard substance spanning over the orifice, and firmly applied to the contiguous palatal surface, is all that is required. When, however, it extends backwards and involves a destruction of the velum palati, and that to an amount which cannot be remedied by surgical operation, it becomes necessary to add to the metallic arch an elastic flap (such as vellum or india-rubber), which will supply the mobile functions of the soft parts as they are when in a normal condition. The former apparatus may be styled *obturators*, the latter *false palates*. In not a few of these cases other portions of the upper jaw become implicated; the alveolar processes may be necrosed, involving the loss of the contained eth and sometimes considerable masses of bone. To replace ese losses various combinations of obturators, false palates, and tificial teeth have to be constructed, and they may be made in ery variety, the different parts being associated together to pply lost parts and to fit by close adjustment those that remain.

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* On the Hæmorrhagic Diathesis, see vol. i. pp. 718 et seq.

The materials of which obturators are made may vary; carved ory, vulcanite (indurated sulphuret of caoutchouc), or flattened etal—gold, platinum, dental alloy, or silver—are all employed. e first, however, is now generally discarded, from its perishable ture. Vulcanite has been extensively adopted; but its thick-ss, and fragile character when very thin, militate against it many cases. I much prefer sheet metal, on account of its rength, thinness, and durability. Silver, platinum, or dental lloy may be employed for hospital purposes; but gold is far etter, and I am in the habit of using it, except in hospital ases. It is an object to have the sheet of metal as thin as ossible without weakening it; and I employ the gold plate educed to No. 6 of the gold-flatter's gauge, being somewhat hinner than is usual for the frames on which artificial teeth are nounted. This degree of tenuity is quite compatible with ntire firmness, and it receives better all the inequalities of the ugous palate: when a plate of this thickness is perfectly adapted to the palatal arch, it is scarcely appreciable to the wearer. As long as sound teeth remain in the upper jaw to which the plate may be attached, it should be supported by means of clasps or collars embracing them; when these are lost, the same object may be achieved by connecting the obturators by means of springs with a frame resting on the lower jaw. Under no circumstances whatever ought support to be obtained either by dilating sponge, or by hooks, or other processes passing into the nasal cavity—the effect of which is to increase the size of the orifice, or prevent its natural tendency to contract. The[*] old and still very common method of treatment, consisting of a disc of metal with a piece of sponge attached to its upper surface passing into the nose, cannot be sufficiently reprehended: it is filthy in its nature, and most injurious to the unfortunate patient's future condition, as the pressure of the expanding sponge causes progressive absorption of the margin of the orifice to an unlimited extent. Any plug kept in position by tight-fitting acts in the same manner. There is a preparation in the Museum of St. Bartholomew's Hospital (ser. I. no. 232), of the skull of a person who lost a portion of the palate, probably by syphilis, and who obtained temporary relief by stuffing the oro-nasal aperture with a large cork, gradually adding to the size of the plug to meet the requirements of the ever-increasing orifice, till the whole of the hard palate had disappeared, the palatal processes of the ossa palati as well as those of the maxillæ being lost. The progressive absorption under this continually-advancing pressure had removed the vomer, the inferior turbinated bones, and the nasal wall of the maxillary sinuses. Such a specimen is an eloquent commentary on this reprehensible plan of treatment. I believe in no instance is it necessary to gain support by the passage of processes of any kind into the nasal cavity, either to wedge against the

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[*] Among the earliest surgical writings we find notices of mechanical appli-nces to repair lesions of the palate. The still common obturator, consisting of metal disc supported by a sponge passing through the perforation into the ose, was invented by Ambrose Paré, an eminent French surgeon (*Les Œuvres Ambroise Paré*; à Lyon, 1541). These and analogous apparatus on the me objectionable plan, were alone employed until Bourdet devised others on rrect principles (*Recherches et Observations sur toutes les parties de l'Art du entiste*, par M. Bourdet; Paris, 1767). Bourdet employed thin sheet metal the form of a vault wholly within the mouth, attached to the teeth at the les, and free from any projection into the nose; and he was aware that

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when thus treated the orifice would contract and frequently close. M. Pierre Fauchard appears to have been the first person who combined artificial teeth with an obturator (*Le Chirurgien-Dentiste*; Paris, 1780). M. Touchard published an account of an apparatus not only to supply teeth and palate, but also a large mass of upper jaw which had exfoliated. This was effected with ivory (*Description d'un obturateur dentier présenté à la Société de Médecine de Paris*; Paris, 1814). M. Delabarre was the first person who succeeded in supplying a soft as well as a hard palate. He accomplished the former with sheet caoutchouc, as have nearly all his successors (*Traité de la partie mécanique de l'art du chirurgien-dentiste*, par C. F. Delabarre; Paris, 1820). But the greatest advance in the construction of false palates was made by Mr. Snell, whose apparatus was essentially the same as those employed in the present day (*Observations on the History, Use, and Construction of Obturators, or Artificial Palates*, by James Snell; London, 1824). The same principles have been carried out with slight modifications, by Mr. Stearns (*Lancet*, vol. ii. 1845, pp. 7, 260, 284, 310): and by Mr. Sercombe ('Cleft Palate; its Surgical and Mechanical Treatment,' *Trans. Odont. Soc.* vol. i. London, 1858). Dr. Kingsley of New York, has devised an ingenious arrangement which very firmly and effectually closes the cleft of the palate. It consists of a wedge-shaped plate of hard vulcanite with a soft velum, forced forward into the fissure, and resting by a ledge upon the nasal surface of the hard palate, thus reverting to the objectionable principle adopted previous to the time of Bourdet ('On the Treatment of Congenital Cleft Palate,' by Dr. N. W. Kingsley, in *Trans. Odont. Soc.* vol. v. p. 195; London, 1865).

sides of the orifice, or to rest upon the nasal surface of the palate.

But an obturator passing over the perforation is not negative in its effect. An orifice which, allowed to remain open, may continue *in statu quo*, or contract in a degree scarcely appreciable, will often rapidly diminish in size when the passage of air and fluid between the oral and nasal cavities is prevented. This is not generally known or understood; but it is of great importance in treating these cases. The obturator should be applied as early as possible—as soon as the dead bone has come away, and while the wound is in a state of granulating activity. It is surprising how the granulations will stretch across the upper surface of the obturator, and close up the orifice; and, in more advanced and neglected cases, the same condition may be imitated to some extent by frequently scarifying the edges of the perforation, always taking care immediately to restore and keep in place a well-fitting obturator. Why the removal of the ill-*effects* of a perforate palate (passage of air and fluid from nose to mouth, and damaged voice), by means of mechanical appliance, should lessen or remove its *cause*, is not very apparent: it seems a curious transposition of events—an inverted sequence: perhaps the protection afforded by the plate to the granulating edge may to some extent account for it: it is, however, true, and very important practically.

Occasionally a portion of the floor of the antrum is lost by necrosis in cases of severe 'abscess' of that sinus, and its cavity becomes common with that of the mouth, by an aperture of variable size. This orifice should be immediately closed, or rather spanned over, by a plate (upon which substitutes for the lost teeth may, or may not, be fixed), and the result will be, in many instances, the development of a membranous growth supplying the lost bone, completely scarring over the wound, and forming a floor to the sinus.

The exact nature and arrangement of the artificial appliances we are considering will perhaps be best elucidated by illustrative cases.

The accompanying figure (Fig. 239) represents the upper jaw of a girl who has recently lost a portion of the hard palate from the effects of inherited syphilis. This cause is, I believe, unusual. I have not seen or heard of another case in which congenital syphilis has had such a result. The patient has suffered from characteristic keratitis, as well as from other symptoms of the disease. The loss of the bone was attended with all the customary conditions of suppuration and fœtor, and after it came away a hole into the nose was left, as depicted in the woodcut. The patient's power of speech was seriously affected, and food and drink passed into the nose. A few days after the bone came away, I took a model of the mouth, and an obturator plate was made as represented in Fig. 240. The girl being an hospital patient, the metal employed was 'dental alloy,' an alloy of silver and platinum, being less costly than gold. Support for the plate was obtained by collars passing between the bicuspids and first molars and the bicuspids and canines.

Fig. 239.

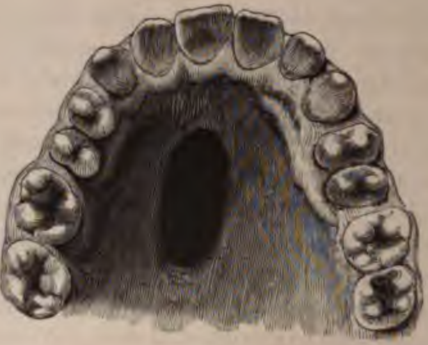
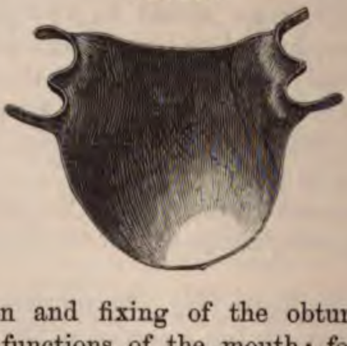


Fig. 240.



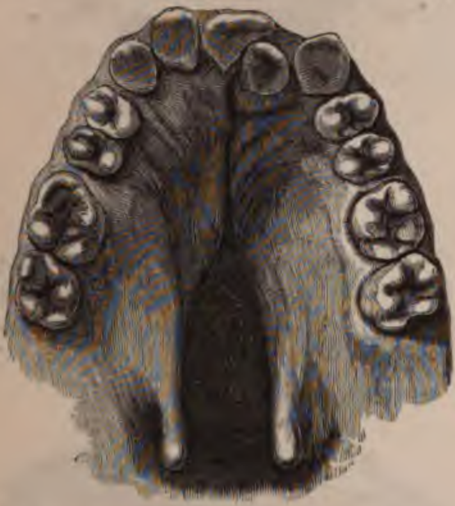
The application and fixing of the obturator *immediately* restored all the functions of the mouth: food was occluded from the nose, and articulation and enunciation were perfect.

This immediate restoration of the voice nearly always, I believe, occurs when *accidental* perforations of the palate are thus treated, and very soon, even where the soft palate is volved in a cleft and an artificial velum has to be supplied. ut with congenital cases it is very different; and the patient s in them to commence a new oral education.

I saw this case again about three months after the introducon of the obturator: the hole had contracted to less than lf its original size, and will probably close altogether.

The apparatus needed to supply the defects of cleft palate is ore complicated, but is scarcely less satisfactory in its ultimate sults. The accompanying figure (Fig. 241) represents the per jaw of a young gentleman, now about seventeen years of e. He was born with cleft palate and hare-lip. The latter was erated on in early infancy with success; and it was intended at the cleft in the palate should ultimately have been closed surgical operation; but the patient refused to submit to the in. The cleft is complete from before backwards, passing to e left in the front of the mouth—an incisor being there nting, as is frequently the case.

Fig. 241.



No difficulties were presented in adapting a hard and soft late to occlude the cleft. A thin rigid gold plate was fitted the hard palate, and support was obtained by clasps between e bicuspids and the teeth on either side, and to prevent the pping of the hinder part, which is frequently troublesome, e thin clasps extended round the back molars. The velum late was replaced by thin soft vulcanised caoutchouc, which I always employ for this purpose. The accompanying illustrations (Figs. 242, 243) showing the artificial palate as seen in face on the oral surface and in profile, render any lengthened description unnecessary. In adapting a soft palate it is necessary that the movable flap should be kept constantly in apposition with the pillars of the fauces during their movements in deglutition &c., and this is effected by means of an elastic spiral cord of gold wire, as seen in the profile illustration. This must be of the lightest possible character, as the power of the muscles to move the flap is very feeble. The same object is sometimes effected by doubling the thickness of the caoutchouc near the hard palate.

FIG. 242.

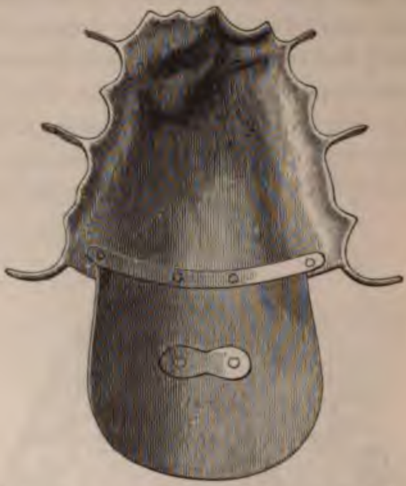
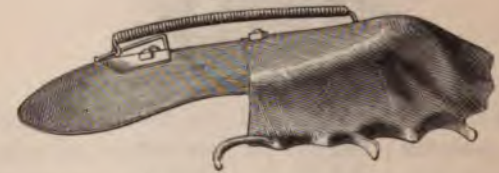


FIG. 243.



When a false soft palate is first introduced, it often produces tickling of the fauces and retching; and it answers well to employ a very small flap at first, and gradually increase its size till it amply replaces the deficient velum.

When the flap is made of soft caoutchouc it becomes sodden time and loses its elasticity; but it is easily replaced, and intelligent patient may do this for himself. To obviate this jection, Mr. Parkinson,* who has had much experience in eating these cases, employs a thin flap of vulcanite; but this ing stiff can hardly apply itself so closely to the pillars of the uces; still, in effect, it is said to answer well.

In cases where large portions of jaw are lost from disease or cident, admirable restorations may be made, especially by eans of vulcanite, and there is scarcely any part of the echanist's art which tells with more effect on the patient's mfort. It is scarcely possible to put a limit to the variety d extent which these useful apparatus may reach.

S. JAMES A. SALTER.

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* 'On the Adaptation of Artificial Palates,' *Lancet*, vol. i. 1867, p. 41.

DISEASES OF THE MOUTH, PHARYNX, AND ŒSOPHAGUS.

TONSILLITIS. *Quinsy. Cynanche tonsillaris.*—The most common morbid affections of the tonsils may be thus classed:

1st. Acute inflammation and abscess.
2nd. Chronic inflammation and enlargement.
3rd. Ulceration and sloughing.

1. *Acute inflammation* of the tonsils is generally preceded or attended by a distinct rigor or chilliness, and general feverish disturbance. Accompanying or following such constitutional irritation, will be found pain in the fauces, and tenderness of the upper part of the throat, in every effort at deglutition. The pain at first is not acute, but rather as if the parts had been bruised, and is diffused over the back part of the mouth and the pharynx. As the case progresses, the local mischief becomes more evident. At first a mere blush, the redness of the part becomes more marked. With the altered colour of the mucous membrane, tumidity of the tonsil will be observed, and before long œdema of the surrounding soft structures. With the increase in the severity of these local changes, it usually becomes evident that the mischief is confined to one side. But the evils of tonsillitis are not restricted to these symptoms alone, nor do the sufferings usually stop short here. Pains in the jaws, and headache; fever and loss of appetite; often severe suffering in the part affected; a loaded, creamy, and swollen tongue, with very foul breath; muffled articulation; great difficulty in swallowing, and fluids attempted to be swallowed escaping through the nostrils; great fear of strangulation; the patient frequently obliged to sit forward, or lie on one side, to allow the abundant saliva to drip into a basin, or drain away on a sponge:—these are the symptoms which

the progress of the complaint, and comprise the chief
acteristics of the attack. As the attack advances, the local
ination of the mouth detects an increase of swelling, which
lly runs forward in the substance of the soft palate, and on
side affected; in aggravated cases even implicating the
es which cover the hard palate as far forwards as the incisor
. With the increase of swelling, a central softening spot
sooner or later be detected, either with the eye, or more
ently at a comparatively earlier period, by an examination
the finger.

uch difference will be found, in different cases, as to the
od at which pus is formed in an attack of acute inflamma-
of the tonsils, *i.e.* as to the period when the abscess may
elieved by incision. In some instances from forty-eight
ixty hours will suffice to insure such a desirable condition.
ther cases, many days will elapse before matter can be
cted by the point of the finger, or upon the thrust of a
pel. During all this time the patient passes his days and
ts in misery ; is not able to take any solid food, and but little
nourishment; obtains very little sleep, and that little of a
urbed character; has difficulty in respiration, caused by
e œdema of the glosso-epiglottidean and aryteno-epiglotti-
folds, and often greatly aggravated by fear, and a nervous
or of approaching suffocation. Inflammation in the acute
attacking the tonsil seldom terminates in resolution: as a
eral rule, it runs into abscess. This abscess will burst sooner
ter if left to itself; and when burst, the urgency of the
ptoms will at once commence to subside. But if the abscess
be opened by the surgeon a day or two previous to what
ld otherwise be the spontaneous period of perforation, by so
h will the patient's suffering be alleviated.

he causes of this form of inflammation appear to be, more
ss, associated with some disordered state of health, which
lers the tonsils and throat especially susceptible to the in-
nce of cold; for to direct exposure to cold may usually be
ibuted the immediate cause of an attack. But the patient
generally be found to have suffered from some constitutional
urbance, previous to the commencement of the sore-throat.
n he is of a gouty habit. Rigors and flushes commonly
ld the attack, before the gland itself becomes the seat of
mmation. Abscess, the result of simple inflammation of

the tonsil, irrespective of those cases which are complicated with scarlet fever, is a rare affection in childhood. It is seldom met with before puberty. It is not a frequent attendant on old age. It appears to be a disorder of youth and middle life.

It rarely occurs that both tonsils are simultaneously affected. But it does sometimes happen that after one tonsil has been the seat of suppuration, the opposite one becomes inflamed and runs into abscess. This, however, is infrequent. We occasionally meet with individuals who are subject to recurring attacks of inflammation of the tonsils, and quinsy. These attacks occur every one or two years for some time, often at shorter intervals. Such conditions indicate especially, and prominently urge, the importance of constitutional treatment rather than simple attention to the local evil. It has constantly been found most serviceable, directly a patient has anticipated the recurrence of such an attack, to administer a stimulating emetic. The action of vomiting not only relieves, by emptying the stomach, but appears also to have some beneficial action locally. In fact, individuals subject to such attacks, and who have adopted such a course of treatment, have expressed themselves satisfied, that suppurative mischief has been warded off by recourse to an emetic in the very earliest stage of a sore throat.

As the attack is usually of a very debilitating character, an emetic of mustard is preferable, on every account, to one of antimony or ipecacuanha. Fomentations to the throat externally, inhalations of the steam of hot water pretty constantly, and a free purgation after the action of the emetic, should be the chief points of treatment. We strongly condemn *as dangerous*, in every sense of the word, the abstraction of blood, either locally or generally, either by leeches or by any other means. Life may be sacrificed by recourse to such treatment. Blisters appear equally unnecessary, though perhaps not equally prejudicial in their consequences. Mustard poultices appear to afford much relief in many cases; their application is often grateful to the patient's feelings; and by repeated application they can be made to keep up sufficient counter-irritation, without the inconvenience of producing a sore place; whereas a blister is a worrying annoyance to one who has already very great discomforts to put up with; and the subsequent discharge is a considerable nuisance, as it runs down and soils the linen, and stiffens the bed-clothes into which it soaks. Moreover, a blister often abstracts a large quantity of serum, and occasionally leaves a very red, irritable, and painful sore on the neck, which, added to the exhaustion following an attack of quinsy, is by no means advantageous.

This disorder is one that calls much upon the strength and vital powers of the patient. During the greater part of the attack, food is taken but sparely, and that in a fluid form. It therefore behoves us to husband the forces rather than diminish them by heroic treatment. As there is much difficulty in swallowing, the less a patient is pestered with physic the less uncomfortable will be his day. At night it may be desirable to procure sleep, if he be restless; and for such a purpose a few drops of morphia will in all probability suffice.

So much is the patient reduced by such an attack, that when the pus is evacuated by puncture, or escapes by an ulcerated opening, it will generally be found that some days of nutritious feeding are requisite, before he regains the strength he possessed and the substance he carried previous to his illness.

Internal local treatment is more open to discussion. Some writers advocate the free application of the solid nitrate of silver to the surface of the inflamed membrane; but it is somewhat doubtful what amount of benefit is secured by this method of treatment. It is certainly attended by one disadvantage; it produces a good deal of local discomfort, leaves a most nauseous taste for some time in the mouth, and gives rise to constant hawking and spitting, until the superficial epithelial sloughs, occasioned by its application, are released or removed from the inflamed membrane. We are not aware that the application, under the acute conditions we have described, is followed by any satisfactory or beneficial results.

If the swelling of the tonsil be considerable, the surface very red, and the part very tender, and yet no very distinct indication of pus be present, it may appear sometimes advisable to make a deep puncture into the part to relieve congestion; or one or two incisions less deep. But as a rule, if the urgency of the symptoms be not great, it is far better to wait the formation of matter, rather than experimentally adopt an exploratory use of the scalpel. Every sensible practitioner studies the feelings of his patient; every good surgeon avoids the uncertain or unnecessary use of the knife. Incisions, if made, often occasion much suffering—are especially dreaded by some who have previously submitted to such treatment—and seldom appear to hasten the escape of matter When, however, pus is detected or suspected, the part should without loss of time be punctured with a knife.

There are some few precautions requisite, when any pointed or cutting instrument is used to open an abscess at the back or side of the mouth. The knife itself need only have, from its extremity, a cutting surface of about half an inch. Whatever knife be employed, it is best to protect the blade so as to cover its cutting edge up to this extent, by wrapping round it, from the handle towards the point, a piece of rag or plaster. A sharp-pointed straight bistoury is of all knives the most convenient for the surgeon's purpose.

In passing the instrument, when protected as described, into, or on withdrawing it from the mouth, the risk of wounding the lips or tongue is necessarily lessened—we may say is avoided; for no such accident should occur in proper hands. On puncturing the tonsil or abscess, an important precaution must be observed. The point of the knife must be kept turned towards the median line, especially after its point is buried in the soft tissues, and out of sight; on no account is the direction of the wound or thrust of the knife to be outwards. By due attention to this simple caution, all risk of wounding the larger vessels, lying on the outer side of the neck, is certainly avoided.

The patient's head should be fixed, either against the back of a chair, or by the hands of a third person. A sudden movement while the knife is passing into the tonsil, might lead to grave mischief, as the instrument might accidentally and unavoidably be thrust in the wrong direction.

The mouth is occasionally opened with some difficulty; and the tongue may be so much implicated in the inflammation that the patient cannot, by his own efforts, sufficiently aid the surgeon to obtain a good view of the swollen tonsil. Under such circumstances, a broad spatula gently applied to the surface of the tongue, will expose the part sufficiently to permit the abscess to be punctured in a satisfactory manner.*

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* A practical hint in passing may here be thrown out, on the best method of examining the throat generally. With many patients it is often a matter of some difficulty to gain a sight of the fauces. The tongue is pushed upwards directly the mouth is opened; and when the spatula is applied with the intention of pushing down the tongue, the patient immediately appears to resist its application with a steady and firm effort. *If, however, the spatula is, without the slightest weight, laid on the tongue, it gradually appears to contract and is drawn backwards, and the fauces are exposed to full view.* No force or pressure is

As soon as the abscess has been punctured, the pus generally flows freely on the withdrawal of the knife; sometimes so abundantly and so suddenly that it runs into the gullet; and from this circumstance, or from the fact that it is often very fetid, it greatly nauseates the patient, sometimes to vomiting. Shortly after the escape of the pus, the patient usually becomes comfortable, expresses himself wonderfully relieved, and soon desires to partake of food. Convalescence is usually rapid and satisfactory.

As we have already said, occasionally, but rarely, the opposite onsil becomes inflamed and suppurates. Under such circumtances an early tonic and stimulating course of treatment may be requisite; and the medical attendant must look, for his guide, o those symptoms which would indicate constitutional deterioration and physical exhaustion, to be met by generous diet and wine, or other stimulants.

In the treatment of all cases of cynanche tonsillaris, there must be a certain amount of anxiety; but the anxiety as to the symptoms which precede the formation of the abscess, is as nothing compared to the anxiety we may have to encounter when unfavourable symptoms are set up *after* the evacuation of the pus. In an unhealthy constitution ulceration may supervene upon the incision, and be followed by sloughing sore-throat; or œdema of the surrounding soft tissues may arise, and travelling downwards around the larynx, pharynx, and œsophagus, terminate the patient's life in a few days. But fortunately these are the rarer evils following upon the evacuation of pus, the result of simple acute inflammation of a tonsil, or true quinsy; the usual history of which complaint is, that directly the abscess has burst or is opened, convalescence is perfect and speedy.

The sore-throat of childhood is rarely acute inflammation of the tonsil ending in abscess. It is usually the symptom or accompaniment of scarlet fever, or partakes of that more frightful and fatal character known as 'putrid' or 'sloughing sore-throat,' of which we shall hereafter speak. The latter is usually accompanied by enlargement of some of the glands of the throat or parotid. In quinsy the throat-glands are seldom affected, and if affected, not to any extent.

Several of the symptoms referred to above, as indicative of

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requisite on the part of the surgeon to effect this; the weight alone of the spatula appears sufficient to insure the object desired. This experiment has been constantly illustrated, on patients suffering from throat-affections, to our pupils.

the formation of pus in an inflamed tonsil, are present, to some extent, under conditions which are apt to be mistaken for quinsy.

A decayed tooth, or a broken stump, will often set up a considerable degree of alveolar inflammation, and be followed by an abscess of the gum or corresponding maxillary region. This condition occasions much difficulty in opening the mouth; the breath is fetid; the tongue becomes very foul and loaded; there is great difficulty in deglutition, and pain of face on the side affected. But generally one marked difference exists between the symptoms of quinsy, and an abscess originating in alveolar inflammation; when a tooth or a stump is the cause of the mischief, there is always more or less swelling of the *face*, and tenderness and swelling, especially over the *maxilla* affected. In quinsy, if there be external swelling present, it is not over the face or cheek; it is confined to the submaxillary region, and the neighbourhood of the parotid.

In all cases of inflammation, either within or external to the mouth or throat, the medical attendant should look with suspicious care to the condition of the mouth. There are few circumstances in practice more apt to be overlooked, than the evils which arise from the irritation of decayed teeth.

2. *Chronic inflammation*, terminating in enlargement of the tonsil and thickening of its mucous surface, is a very common condition; more especially to be observed in children, and in young persons of both sexes under the ages of from twenty to thirty. The tendency to this form of diseased action and enlargement, is mostly observed in individuals of a strumous or lymphatic habit. The enlargement frequently commences as early as the second year of life, and has been observed to occur more especially in children who have been weaned when very young, or brought up by hand-feeding. Less frequently, it does not show itself until towards the period of approaching puberty. It has a tendency to affect females in a greater proportion than males, though it is by no means an infrequent complaint in the latter sex.

The commencement of chronic enlargement of the tonsils appears to be unattended by any marked symptoms, local or general. Rarely is attention drawn to the condition of the part until either the thickness of the articulation, or loud snoring in sleep, excites the mother's curiosity, or gives rise to anxiety, when an examination of the throat is instituted. Pain is never a symptom attendant on these swellings. The only local symptoms are those which necessarily arise from the mechanical encroachment of the tonsils, in the median line, betwixt the external oral and nasal apertures, and the internal apertures of the breath- and food-passages. The intensity of these symptoms will depend on the size of the masses on either side of the fauces.

The causes which produce this chronic enlargement of the tonsils are not satisfactorily established. A careful inquiry into the history of a large number of cases has failed to detect any one specific reason to account for this diseased action. It does not appear to depend on cold, or insufficient nourishment, nor on want of cleanliness; for it will be met with in the children of the upper, as often as in those of the lower classes, and as often in those who are well provided and tenderly cared for, as in those who are the children 'of sorrow and acquainted with grief.'

This diseased action does, however, appear to affect in a larger proportion those children who have been brought up by hand or early weaned, than those who have been supplied for a sufficient time with the mother's breast-milk. The enlargement of the tonsils will also frequently commence, on the convalescence from severe attacks of the various eruptive or other forms of fever. Most frequently, however, their growth is grafted on a strumous diathesis.

The forms under which enlarged tonsils occur deserve some attention. One of the most frequent appears to be a uniform globular projection on either side, to a greater or less extent. In this condition the swelling may cease to grow, and remain stationary for years, without inconvenience or injurious consequences. Or the glands may slowly and steadily increase in size, until their surfaces touch below in the median space and above either side of the uvula. In other instances, the tonsils appear to enlarge towards the soft palate, and often upwards past its free border, as well as downwards so low that the lower end is hid from view by the base of the tongue, and is only with care detected when the latter is well depressed; or the tonsil on one side only may be seen to project, a perfectly round mass, which is attached to the fauces by a thin pedicle of mucous membrane: occasionally an outgrowth has been seen, a pendulous tumour hanging from the natural position of the tonsil.

The surface of an enlarged tonsil is generally somewhat uneven, often very much pitted; the mucous membrane thick and velvety, and seldom without an increased vascularity. In many instances all these conditions may be observed in an aggravated degree. Often, superficially ulcerated spots are seen dotting the surface of the swelling; or, what is more common, small points of thick sticky sebaceous secretion will be observed, marking the orifices of some of the ducts which lead into the substance of the gland-tissue.

The fauces, especially when the enlargement of the tonsils is considerable, may often be seen covered with a viscid yellowish semi-purulent secretion; this clings to the posterior surface of the glands, or lines the walls of the upper portion of the pharynx.

When the enlarged gland projects to any extent above the soft palate, some degree of deafness is occasionally complained of. This concomitant symptom appears to depend rather upon the thickened condition of the mucous membrane, which, extending from the tonsils, runs up to, and may line, the Eustachian tube, than upon any actual encroachment of the gland on the orifice of the tube.

Enlarged tonsils appear to be the result, not the cause, of constitutional derangement, provided they do not become large, or encroach much on the isthmus of the fauces. But if they increase in size, and much lessen the passage from the mouth to the pharynx, many unpleasant effects may be detected. The voice is generally somewhat unnatural and muffly, and the pronunciation thick. So that enlarged tonsils appear to be a perfect impediment to the production of fine sweet notes in song, or clear sonorous tones in speech. The breath is often offensive; partly rendered so by the decomposing sebaceous secretion sticking in the orifices of the glands, partly by the thick semi-purulent mucus which clings to the fauces.

The enlarged glands are constantly liable to attacks of ulceration, and sometimes to acute inflammation attended by fever. If large in children, they produce more general effects on the system than in adults. They now interfere with perfect and free respiration. At night the child snores loudly; often awakes in his sleep, and as often in a state of alarm. In some instances the natural and requisite amount of rest is so interfered with that the child's health suffers. There is also frequently some little inconvenience in swallowing, and care is observed to be taken by the child that only small quantities of food be swallowed at a time.

If a section of a portion of an enlarged tonsil be examined carefully, it will be found, to the touch, firm in consistence, and somewhat elastic when pressed. The face of the cut surface will present several small uneven and irregular depressions, from which may be picked, every here and there, or squeezed out, small collections of sebaceous matter. The structure of the enlarged mass consists of condensed areolar tissue, which often runs like bands between and around the depressions above alluded to. The naturally soft structure of the gland is so condensed and firm, that it assumes the character of fibrous tissue intersecting the substance of the growth in every direction.

The accumulation of epithelial secretion within the ducts of the glands, occasioned by the obstruction of their orifices, is the explanation of the formation of the cavities seen on a section of the gland: for as the secretion increases, and cannot escape through the obstructed orifices of the ducts, it collects in the latter, dilates them, and sets up chronic inflammation of the structure of the gland itself, which terminates in its permanent enlargement.* This secretion will frequently be observed to escape from the surface of the enlarged tonsil when it is firmly pressed between the blades of the vulsellum prior to removal.

The treatment of enlarged tonsils may be summed up in a few lines. Unless the voice be affected to such an extent that it becomes desirable to lessen or remove them; unless the disturbance to the sleep of the child be manifestly interfering with health; unless the breath be rendered fetid or offensive by the secretion from the ducts; or unless some other cogent reason render it desirable to interfere with the mass—it is better to leave the tonsil in its slightly enlarged condition, without the application of any local or constitutional measures. If a child so affected be delicate, and the tonsils appear increasing, we prefer constitutional to all local treatment short of that of removal. In the early stages of enlarging tonsils, if detected, it would be best to administer tonics as a rule, as they certainly act beneficially as regards the health; and by so doing, as far as experience allows us to hazard an opinion, arrest the progress of the growth. At any rate, under a tonic treatment such enlargements frequently remain stationary. Steel-wine, muriated tincture of iron, citrate of iron, syrup of iodide of iron, and cod-liver oil, each according to the constitutional peculiarity, may be prescribed with safety, and taken with evident benefit for many weeks or months. We need hardly caution the reader on the importance of attention to diet; and with very weakly children, sea-bathing is of the utmost advantage.

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* Kölliker has given a minute account of the pathological conditions of the tonsil, and the abnormal secretion of the gland under such changes; but as any transcript of his investigations would not add to the practical importance of this subject, we beg to refer those interested in the question to the original, *Manual of Human Histology*, vol. ii. p. 30 (Sydenham Society).

Local applications are frequently recommended, and too constantly adopted. Nitrate of silver rubbed over the surface, or points of nitrate of silver run into the substance of the gland; sometimes nitric acid carefully applied to portions of it; stimulating gargles; and a variety of troublesome and useless applications, have had their advocates for the arrest or removal of these masses. But an examination of a portion of a gland removed by excision will show such structural changes, such a fibrous thickening of the finer areolar tissue, that it appears to the author a useless waste of time and material to attempt to procure absorption of such dense tissues. Nothing short of an actual slough can do good, if caustic be used; no stimulating application can offer much hope of acting on such a structure; it is therefore best not to waste time or inflict pain by having recourse to such useless local measures. If constitutional treatment does not arrest, and local treatment be requisite, removal by the knife of a portion of the gland is the speediest, and, in our opinion, the only efficient remedy. The surgeon with a knife can remove all that is necessary in a few seconds; and the patient will be entirely rid of the consequences within a week after.

When the glands are so large that some portion must be removed, to relieve the symptoms of discomfort or distress from which the patient suffers, the operation is simple enough in adults; but may be somewhat troublesome when necessary in a young child.

It will be found advantageous to place the child sufficiently under the influence of chloroform, so as to allow the mouth being easily kept open. The tongue being then depressed, a portion of the gland may be seized with the vulsellum, and rapidly cut off with a blunt-pointed straight bistoury, the cutting-edge of which should only be exposed, near the point, to the extent of an inch. If there be any difficulty in keeping the mouth sufficiently open ience of a previous one. But in an adult it may be left to iscretion or wishes of the patient, whether the operation be leted at once, or at a subsequent period. If the tonsils ery large, it is always advisable to take away a considerable on of each. But it is by no means requisite to remove the of the projecting mass. If half of the mass be removed, the cells thus laid well open, what with their becoming ied, the relief occasioned by the incision through parts ically inflamed, and the subsequent contraction of the cut ce by cicatrisation, the portion that is left shrinks and into the side of the fauces, to give no further trouble to atient.

ter the removal of the mass, the patient generally suffers ittle; or rather as one affected with slight sore-throat. precaution to be given is, to use soft food, and to avoid ure to cold for a few days, when the cut surface will be healed. Hæmorrhage rarely follows to any troublesome t on this operation; but it may, and sometimes does occur. surgeon, always anxious to avoid such a contingency, should the precaution, when operating, to draw as much of the as he conveniently can well into the cavity of the mouth ds and forwards, so that a large portion may be seen prog from the attached base; not more than half of the mass be removed, and even as much as this only when the ur is of considerable size. Such a portion will always be sufficient for the ultimate relief of the patient, and the val of all the previous disagreeable symptoms. In the ice of the author, such a proceeding has never been little patient showing signs of faintness. If, on examination, any distinct vessel is seen to bleed, a ligature can be applied with a little care; or recourse must be had to pressure, if the bleeding is from the general surface.

We need only refer to the proposal to remove enlarged tonsils by the application of ligatures, to condemn the plan of treatment as tedious, painful, and productive of much offensive discharge, until the slough separates.

3. *Tonsillitis maligna.*—Ulceration of an acute form attacking the tonsils, and rapidly running into sloughing of the fauces, is a very grave—often a most intractable—affection; and as rapid as it is unmanageable.

Sore-throat is the first symptom complained of, and with it the patient probably expresses himself as feeling ill. Rigors, followed by feverish disturbance, will generally supervene. The tonsils will soon be observed to be of a dusky-red colour, and swollen; and the surrounding soft tissues and uvula are already œdematous. There will generally be much pain, and some difficulty in deglutition. Patchy shreds of grey or yellowish membrane appear embedded in the surface of the tonsils. These, after a time, spread, unite, and become deeper, until a considerable portion, if not the whole, of the soft palate may become implicated in the spreading mischief. The discharge which accompanies this form of slough escapes freely from the nose; for as the havoc spreads, the passage of even fluids to the throat is rendered difficult, and is often entirely intercepted by the œdematous state of the cellular tissue below the root of the tongue—so that liquids taken by the mouth are rejected through the nostrils. The character of the discharge is usually most offensive and intolerable. The room has to be kept well aired, and a constant and liberal use made of solutions of chloride of soda or lime, to moderate the fetor occasioned by the discharge.

If the patient survives, large sloughs separate from the parts attacked, and a considerable granulating surface may soon be observed, marking the havoc of the disease which has passed. In this havoc the whole of the uvula, and a considerable portion of the soft palate, have been seen to disappear, the patient's health being subsequently perfectly restored; though there remain for life the permanent defect, the alteration of the voice, and the inability to articulate distinctly—the results of the local injury to the soft palate.

In the greater portion of severe cases of malignant sore-throat, the probability is, that they are specific, or only a type of the severer forms of scarlet fever. But still the surgeon's experience may be sometimes advantageously referred to in some of the stages of such cases; and for this reason we have taken a brief notice of them.

As in sloughing of other tissues, so in that of the throat, under all circumstances a stimulating and tonic treatment must be pursued; wine must be freely given; and with children, the muriated tincture of iron in full doses may be most advantageously administered. It is most efficacious as a tonic in such cases; can be given in small bulk; and, with the addition of a little syrup, forms a mixture children do not object to—a desideratum of no small importance in their management when sick.

A superficial and less severe form of ulceration of the tonsils is a very common occurrence. 'Ulcerated sore-throat' is a term so familiar, and a condition so well understood among the more industrious and often over-worked students of our hospitals and dissecting-rooms, that it requires but little description here. Pain and some difficulty in swallowing; a creamy tongue; soft, weak pulse; pallid face; loss of appetite, and often loss of sleep; much languor and pains in the limbs; tonsils congested, and somewhat swollen; small, irritable, superficial, and scattered ulcers on the fauces and tonsils: such are the chief symptoms found to accompany one of these attacks.

The treatment is well understood. Change of air; a stimulating gargle; a slight aperient if requisite (mercurials, however, to be generally avoided); the internal administration of bark and ammonia, or chlorate of potash; and a nutritious fluid diet, with a few glasses of wine daily. Convalescence is generally satisfactory under such treatment. In all of the more acute inflammatory and ulcerative actions affecting the throat and tonsils, the internal administration of chlorate of potash, as well as its free use as a wash or gargle to the part, appears to be attended by marked benefit. A lotion of the permanganate of potash is also most agreeable in such cases; for, as a gargle, it leaves a very pleasant taste in the mouth, and rapidly renders inodorous offensive discharges. It may with safety be used largely as a gargle or wash in all throat affections. So also a gargle of a weak solution of carbolic acid.

'Relaxed uvula' is by no means an uncommon complaint.

The term does not quite describe the actual state of the parts in their altered conditions; for the uvula may be thickened and not increased in length. Under such circumstances it occasions but little annoyance, and seldom requires attention. Or it may be lengthened without being thickened, and this is the most common evil; and then surgical interference is necessary.

The increase of size, or the elongation, appear to be as independent of the condition spoken of under the name of enlarged tonsil, as the two conditions are of each other.

The increase of size is usually accompanied by a thickened state of the mucous membrane, and often a slight tenderness of the part. Though the thickening may remain, the tenderness after a time will subside; and then the part is left in a permanently enlarged, though not in a persistently enlarging, condition. It seldom increases to an inconvenient size.

Should the symptoms which attend the first increase of size be troublesome, the simplest local remedy is to smear the surface once or twice with the solid nitrate of silver; and constitutionally use such measures as the general condition of the patient will indicate to the observant practitioner. Usually the condition is one which is benefited by tonics. Elongation of the uvula appears to be generally dependent on an excess of mucous membrane; for the azygos uvulæ muscle does not often form any part of the increased growth. The mucous membrane may extend an inch beyond the extremity of the muscle, and hang down like a thin narrow slip of tissue, ending often in a point. When of this length, it dips into the pharynx, and the point rests over the aperture of the larynx. This contact with the larynx keeps up a constant source of irritation, and occasions a troublesome cough. Frequently the tickling of the fauces and pharynx produces nausea and a tendency to vomit. Patients sometimes, after food, on coughing, reject a portion of the meal taken. These symptoms are often attributed to other causes, until the throat is examined and the condition of the part detected.

This elongation of the uvula is not often seen in children, but most frequently in the period of middle-life. It is seldom observed in old age.

The treatment is as simple as the relief is certain. Removal by knife or scissors is the only treatment to be entertained for a moment. The point of the uvula is to be seized with a long pair of forceps, and cut off so near to the base as to leave the part of its natural length.

The patient may feel the throat a little sore for a day or two, but no treatment beyond ordinary care will be requisite. The uvula is very apt to be implicated in inflammation about its neighbourhood; and constantly, under such circumstances, becomes œdematous. This condition, however, is seldom confined to the uvula alone, but implicates usually the soft palate and adjacent tissues. It depends on erysipelatous or diffuse inflammation of the cellular tissue—a dangerous and often fatal affection, which will be found treated of in the essay on DISEASES OF THE LARYNX.

Tumours of the soft palate and fauces are sometimes met with of a non-malignant character, and independent of inflammation. These usually consist of, 1. Fibro-cellular tissue; 2. Cysts; 3. Warty growths of a non-malignant character, occasionally met with attached to the soft palate, and growing apparently from the mucous membrane.

It has occurred to the author to have to remove such growths in two instances in young women; in both, the growths commenced without being noticed, and were accidentally discovered; they were readily removed, and were found to consist of simple epithelial structure.

1. The small fibro-cellular tumours usually assume a pendulous character. They are painless; usually attached to the free border or upper surface of the soft palate; and are generally only detected when they become locally inconvenient by dropping down below and behind the root of the tongue. They are usually somewhat slow in their growth, and as they increase in size become more pendulous, often supported by quite a thin pedicle. They can be readily removed with scissors and forceps.

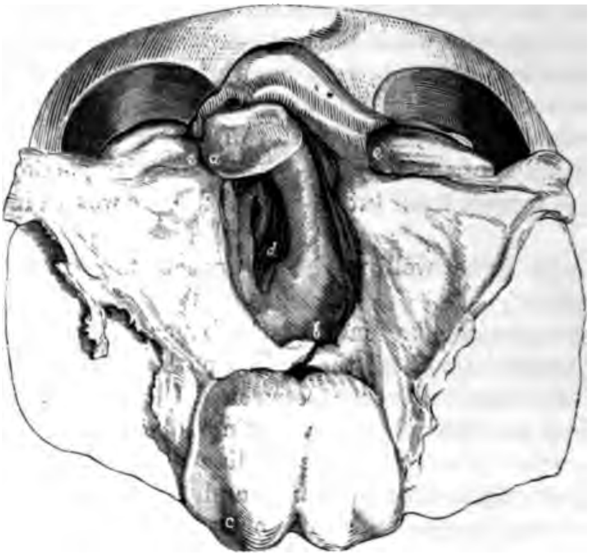
2. *Cysts* of these parts commonly contain thin glairy fluid, generally the result of obstructed muciparous ducts. They are readily treated by a simple free incision, and a subsequent application of solid nitrate of silver, or a drop or two of nitric acid, applied on a probe to the interior of the cyst.

Sebaceous cysts are occasionally found in the substance of the soft palate. They may be recognised by their yellowish white colour showing through the mucous membrane. They only require to be laid open, and the interior of the cyst touched for a day or two with a probe dipped in nitric acid.

later period, but probably within the first twelve weeks of fœtal life, in accordance with the extent of the deformity. The variations may be thus classed:—

1. The most extensive; a double cleft of the alveolar ridge* with a fissure from each cleft running backwards and inwards, and joining together immediately behind the intermaxillary bone, and being continuous with a median fissure through the entire hard and soft palate.

FIG. 244.



Complete cleft of the palate with double hare-lip. (From a preparation in the Museum of St. George's Hospital.) *a*. The intermaxillary bone. *b*. The septum nasi. *c*. The tongue. *d*. The cleft into the nasal cavity. *ee*. The separated halves of the upper jaw.

2. A single cleft of the alveolar ridge on one side or the other of the median line; running back into an entire cleft of the palate.†

3. The alveolar ridge entire; the cleft of the palate commencing immediately behind it and complete backwards.

4. The cleft running as far forwards as the middle of the palate-processes of the superior maxillæ, or through the palate-bones only.

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* The cleft of the alveolus under such circumstances is often complete throughout on each side from front to back, and from the mouth into the nostril.

† Instead of the alveolar ridge being cleft, as described, in this variety, there may be only a notch, or a large or small foramen through its base. The cleft has been partially closed by growth, or by pressure of the lip.

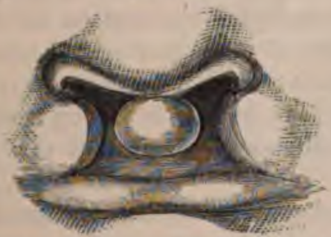
. Fissure of the whole of the soft palate, or only implicating uvula.

Between the extreme of one and the other every gradation of ent may occur.

Occasionally, but rarely, a congenital defect is met with in median line, either as a circular or oblong opening: in nt and behind it the palate is closed. These openings most quently occur in the palate-bone; and usually, when such opening exists, the median line of union is very plainly rked on the under surface of the soft palate and the uvula, by listinct straight thin cicatrix, showing the union of the sides the soft palate completed, although the palate-bones, in consequence of their defective development, were unable to perfect e naso-oral septum in their immediate neighbourhood.

It will be observed in some cases that the gaps through the veolar ridge are excessive, *i.e.* complete from mouth to nostril; hile in other cases they are but partial. When excessive, d when the fissure is complete through the hard and soft late, the intermaxillary bone, or 'os incisivum,' becomes ten widely separated from the superior maxillæ, and forms a dule more or less round (the horseshoe lobe of fœtal life ready described), which is supported by and attached to the terior inferior termination of the septum nasi. This nodule

Fig. 245.



Double hare-lip, showing the intermaxillary bone attached to the septum nasi.

ay be more or less prominent, and is occasionally so much so hat it appears simply to be stuck on to the tip of the nose. nder these circumstances it is but little covered with skin, hich is merely a prolongation from the integument on the ex of the nose, and unconnected with the integument of the on either side.

If the nodule be dissected between the sixth and eighth onth after birth, in it will be found not only the temporary incisors, but also the germs of the permanent ones; not always the lateral, but invariably those of the central incisors. Occasionally those of the lateral will be found, though they frequently are sacrificed by the freak played by nature in permitting these gaps to occur.* Whenever a single fissure occurs through the alveolus, the gap will not be found in the median line, but, as a rule, on one side or other of it. We cannot satisfactorily explain this. It may depend on the peculiar conformation of the upper jaw and its early development. We would refer those interested in the subject to the further consideration of Mr. Goodsir's observations.

It is rare indeed that the infant born with extensive cleft palate and alveolus has not also the upper lip notched or fissured opposite to the defect in the bone. Usually, if not invariably, when the cleft of the alveolus is double, the cleft of the lip will correspond; when single, the lip is usually similarly affected. But when the cleft of the alveolus without cleft of the palate occurs, hare-lip is not always present.

In complete cleft of the roof the attachment or disposition of the septum nasi varies in different cases. As a rule, the more extensive the gap, the greater the deformity. The septum will often be seen, in complete cleft of the palate, to be continuous by its lower border with the margin of one or other of the edges of the cleft; in which case one of the nasal cavities is so far shut off from the mouth, while the other is open to it. In other instances the septum dips down between the nasal fossæ almost as low as the edges of the fissure, and terminates in a free defined border, unconnected with the superior maxillæ; or it will be sometimes seen bent or folded on itself, its edge turned up to one side, with one of its lateral surfaces facing downwards.

These different conditions of the septum have no practical bearing on the subsequent treatment of the case. Rokitansky alludes to fissures of the palate caused by the absence of the os incisivum, and attended by fissure of the upper lip *in the median line*;[*] but he does not state that he had met with an example of this rare deformity. Sir Wm. Fergusson,[†] in alluding to the occurrence of cleft in the lip, says: 'Doubtless it has been named hare-lip from a certain resemblance to the fissure in the upper lip of the hare; but in the human subject it differs in this peculiar feature, that it never is in the mesial line, as it always is in the hare.'

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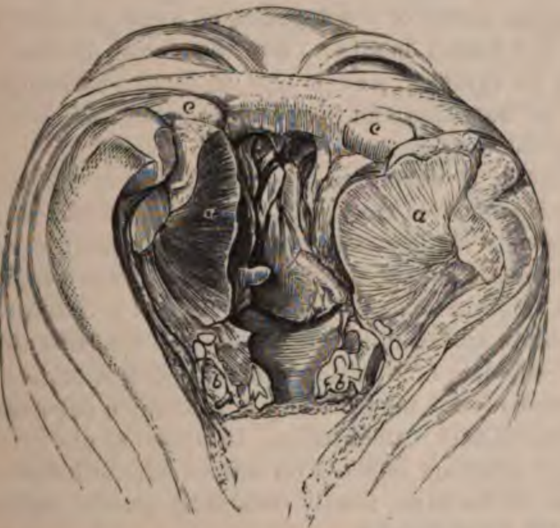
* When this nodule is very prominent, and appears likely to interfere with the success of an operation for the closure of hare-lip, we would strongly urge the importance of depressing it forcibly rather than removing any portion or the whole of it. It may be forcibly broken and depressed, and made to fit in the gap between the superior maxillæ, where it will almost invariably become firmly fixed, and subsequently have shooting out from it some or all of the incisors. If these be defective, the surface of the bone forms an excellent rest for a plate to carry artificial teeth. If the os incisivum be removed, the superior maxillæ are certain to be more or less drawn together by the action of the upper lip, the latter become much flattened. the upper portion of the mouth much narrowed and the gap in the alveolar ridge never entirely closed.

FIG. 246.



Fissure of the palate in the median line. (From a preparation in the Museum of the Royal College of Surgeons.) *a a.* The tongue divided in two in order to expose the cleft. *b b.* The larynx similarly divided. *c c.* The two halves of the upper lip and jaw, between which is the cleft opening freely into the nasal cavity, the intermaxillary bone being absent.

Rokitansky only alludes to the occurrence of the fissure in the median line, but gives no details of any peculiarities which might be supposed to accompany such a defect. Sir W. Fergusson had apparently not met with a case; and the deformity is no doubt most rare. But a specimen such as Rokitansky refers to —the result of absence of the os incisivum and fissure in the median line of the upper lip—may be seen in the Museum of the Royal College of Surgeons in London. In this preparation (of which no history is recorded), the fissure of the upper lip is in the mesial line, the result of a great gap, as if a large portion of the middle of the lip were destroyed; the os incisivum is altogether deficient, no vestige of it being present; and the cleft of the hard and soft palate is complete.

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[*] Rokitansky, *Pathological Anatomy*, vol. ii. p. 3.

[†] *Practical Surgery*, p. 584.

But there is this additional interesting feature in this remarkable specimen: the anterior nasal apertures are wanting. The explanation of this latter defect appears to be simple. The os incisivum being absent, the septum nasi has nothing to attach itself to in front and below. The anterior orifices of the nostrils are therefore defective; the apex of the nose does not project; the alæ are flattened; and as the *entire* floor of the nares is deficient, and the anterior lower portion of the septum terminates by a free edge, the would-be anterior orifices of the nostrils are merged in the median gap of the lip, alveolar ridge, and mouth. Probably the child was still-born, or died soon after birth.

We do not attempt to enter into an explanation of the cause of cleft palate. We possess no data to justify the pretence that observation has thrown any light on what may reasonably be considered an arrest of development at some period of fœtal life prior to the fourth month. But the cause of that arrest is shrouded in mystery, and is one of those aberrations in the function of nutrition and growth, to account for which is entirely beyond our present knowledge.

Thus much, however, we may state, that in the isolation of the os incisivum from the superior maxillæ, we find an approach to a somewhat similar arrangement in the teeth of the upper jaws of certain animals, in whom the incisors are separated, by a distinct interval or gap, from the bicuspid or lateral teeth.

Cleft palate and cleft lip are frequently found to affect more than one member in a family; but we cannot state that congenital cleft of the mouth or lip is a common occurrence, as a result of hereditary transmission. It is rare to observe both the parent and offspring affected on either side, although brothers and sisters of the same family constantly present different conditions of the deformity.*

Practically, the more extensive the cleft in the palate, the wider it will generally be found, and the more upright will be the surfaces forming the sides of the gap. Usually the cleft in the palate is narrower in front, and widens towards the velum. But much variety will be found if a large number of cases are compared with each other. In some the gap will be very wide; in others, though it be complete from alveolus to uvula, the gap will be very narrow. When the cleft is only partial, the less it encroaches upon the hard palate, the more natural will be the arch of the roof in front; and the sides of the partial cleft will also somewhat partake of the natural curve of the arch rather than run upwards, as is almost always the case when the cleft is considerable, or extends entirely through the palate and alveolus. Though the extent of the cleft be restricted to a small portion of the palate-bone and the soft palate, it by no means follows that the cleft is equally narrow in proportion; on the contrary, it will be frequently found that these partial clefts are very broad; so much so in some instances, that the palate processes of the palate bones and the sides of the bifid soft palate appear to be almost wanting. These partial clefts have been found to present, in some few instances, the greatest breadth met with; even to such an extent, in one or two instances, that operative interference was considered unjustifiable, as there did not appear, even of the soft palate, sufficient tissue to allow of the edges being brought together by suture.

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* How far civilisation or crowded populations may influence congenital deficiencies in the human subject, is a question to be hereafter worked out; but it is a curious fact, that most of the young of the lions caged in the Zoological Gardens of London are born with defective palates, and consequently die soon after birth. As far as our limited means have enabled us to ascertain, it appears that it is not usual for the lion family, in a state of confinement, to have their young similarly affected, but that this congenital defect is restricted to the lions kept in the Regent's Park, as if some local influence were instrumental to this end.

The primary effects of cleft palate, when extensive, are sufficient to create much necessary alarm for the safety of the infant's life. If hare-lip exist, with double or single cleft of the alveolus, and a broad cleft of the roof, unless the infant be supplied *plentifully* with its mother's milk from the first, it will probably soon sink from exhaustion. It is very difficult in such cases to introduce a sufficient quantity of milk into the stomach, to insure an amount of nutrition equal to the maintenance of life. The mother's milk is the only food that should be given for the first six or eight weeks. In all cases of cleft palate, the infant is unable to suck the nipple: for as the naso-buccal septum is wanting, the child cannot create with its tongue a vacuum in the mouth, and is therefore unable to draw the ducts of the mammary gland. There is no alternative but to hand-feed such an infant. It will be found most convenient to place the infant in the upright posture while it is fed; this position allows the fluid nourishment to flow backwards and downwards into the pharynx, instead of running into the nares and out of the nasal apertures, as is often the case when the child is fed lying on its back.

After a few weeks of this careful nursing, the child will begin to take its food with greater facility; and as it grows older, with a freedom which is somewhat surprising when the amount of defect in the palate is considered. But as these children have often a very great struggle for life in the earlier weeks, we repeat that *breast-milk should be alone given.* The milk should be drawn from the mother or nurse, and given with a bottle, to which a smooth flat ivory pipe is attached; its orifice should be small; and the flow of the milk through it so managed that suction is not requisite, but at the same time the current be gentle, and easily regulated by the inclination of the bottle in the nurse's hand ; or a small piece of sponge dipped in the milk and then placed in the mouth, will often be found to answer equally well, but of course the process requires to be repeated as often as the milk is sucked out of the sponge. So much as regards the early nursing of a child born with cleft palate. The question now to be considered is, whether any treatment may be desirable to alter, or improve, by surgical interference, the condition of the mouth; and if so, what that treatment should be, and at what age such treatment may be safely and successfully put in practice. In the first edition of this work, we stated our opinion that it was not desirable to attempt to close the fissure of the palate, by operation, during infancy, and that such treatment was better deferred to a later period, when the patient was old enough to judge for himself whether he would prefer to wear an artificial palate for life or have the fissure permanently closed, and was moreover of an age to submit to an operation without the aid of chloroform.

Since that time, however, the experience of others, as well as our own, has induced us to materially alter our opinions and practice in this respect.

Mr. Thomas Smith, of St. Bartholomew's Hospital,* was, we believe, the first to introduce the use of chloroform in operations on the palate in children; and he has entirely proved that under its administration clefts of the palate may be readily and successfully operated on in childhood at a very early age. Prior to the publication of Mr. T. Smith's observations, other surgeons had succeeded in closing such clefts in young children; † but Mr. Smith, in addition to the information he has given to the profession, that chloroform can be satisfactorily employed in such operations with considerable advantage to the surgeon, has also, it may be said, still further perfected the steps of the operation, and rendered it one of comparative ease and simplicity, by the introduction of his ingenious gag for keeping the jaws asunder while an operation is being proceeded with.

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* *Trans. Med.-Chir. Soc.* vol. li. p. 79.

† In one case operated on by M. Billroth of Zurich, a cleft extending from the lip to the uvula was closed by successive operations before the age of twelve months. See Billroth, in Langenbeck's *Archiv*, vol. ii. p. 657.

There is no doubt now that treatment by surgical interference may be had recourse to, to close the cleft long previous to puberty; but we are of opinion that the surgeon should still be somewhat guided by the age of the child, as to when the operation should be performed.

The real object of the operation of closing the cleft in the palate is to enable the patient to articulate hereafter, plainly and intelligibly—*not* to enable the child to take food. An infant with extensive cleft, when first born, has often some difficulty in taking sufficient food to satisfy its wants, or to nourish it, as it would be nourished were its palate perfect; but usually this difficulty is overcome in a few days, and if proper care be taken the infant usually thrives. An operation at this period is therefore not requisite, nor is it desirable: the loss of blood the infant would sustain in such an operation would be attended by great risk to life; the tumefaction and tenderness of the mouth subsequent to the operation would be sufficient to interfere greatly with the infant taking a proper amount of nourishment; and both the loss of blood and the insufficient quantity of food might materially interfere with the union of the flaps, even supposing the infant does not sink under these circumstances. A very slight loss of blood may prove fatal in a very young infant, especially in one of a puny delicate nature, such as children with cleft palates often are; but the loss of blood in an operation for cleft palate is often severe, more especially when the hard palate is dealt with; great risk would therefore be run by the very early application of this operation, and fatal results would inevitably occur in many cases.

Dr. Ehrman,* in a very interesting and complete memoir on the subject of cleft palate, mentions the deaths of four cases, in infants in whom the operation on the hard and soft palate had been attempted—one of four days old, one of five days, and two of two months each. As a child does not commence to articulate, as a rule, before twelve months old, nor to pronounce many words before two years of age, there is no imperative haste for the adoption of the operation before that age, nor is there any advantage to be gained by its earlier completion. The reasons are strong against its performance prior to this period of life; some few months later, the child is in a much more favourable condition to undergo the operation, and less liable to succumb from the effects of loss of blood. Under all these circumstances it is safer, and ultimately equally efficacious for the improvement of the articulation, to defer all operative interference until the child is two or three years of age. With the use of Mr. Smith's gag and the administration of chloroform, the operation may now be undertaken without hesitation, can be readily performed, and in a large majority of cases will be successful. In children with entire cleft of the hard and soft palate, we recommend the closure of the soft palate as the first step in the operation. If this be successful, the aperture left in the hard palate will in most cases diminish considerably in the course of some few weeks. Dr. Ehrman mentions this to have occurred in cases under his observation, and we can confirm his experience by our own. It is, in fact, one of the great advantages of an early operation on the soft palate, that when successful the continued action of the muscles behind the maxillary cleft tends to approximate the edges of the latter; similar to what is observed to take place in any extensive gap in the alveolar ridge after the fissure in the upper lip has been some time closed.

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* *Étude sur l'Uranoplastie.* Paris, 1869.

As the most simple form of cleft is that confined to the velum or soft portion, we propose to consider, first, the method to be adopted to close it, irrespective of any extension of the fissure into the hard palate.

Should the uvula alone be bifid, very little is requisite to secure union of its opposed edges; and indeed, if the voice be not affected, nor the cleft detected by any peculiarity in the articulation, it is better not to meddle with the fissure. Cleft of the uvula, however, usually affects articulation. The surgeon need have no hesitation in undertaking the operation. The opposed edges of the bifid uvula should be pared, care being taken to carry the incisions on either side a little way into the soft substance above, so that they meet in the median line in front of the commencement of the cleft; care must also be taken that the mucous membrane at the edges is sufficiently removed to insure two raw surfaces being adapted to each other. The surgeon should first seize one point of the bifid uvula with a pair of long spring forceps, and draw it forwards, transfix it near its inner border with a narrow sharp knife on a long handle, and freely cut upwards and downwards, in order to remove the mucous membrane along the whole of its inner margin. A similar proceeding on the opposite side completes the use of the knife. A couple of sutures will be sufficient to approximate the edges and keep them in place.

Mr. T. Smith observes with respect to the material to be used for sutures, that he has found fine fishing-gut best adapted for the soft palate in the young; or horsehair for the lower part of the velum and uvula; both these substances, if soaked for a few minutes in water, will become sufficiently supple for use.*

In the experience of the author, fine silk is as efficient for the purpose of sutures as any other material, and is preferable to most. Such sutures are readily introduced, and very readily removed. The latter is not a point of trivial importance, and is an advantage when the soft palate is concerned, which does not equally apply to metallic sutures. The author has invariably used silk sutures in all operations for cleft palate, and with the most satisfactory results; nor has he, from the experience and experiments of others, seen any good reason to prefer any other material.

When a cleft extends forwards through the whole of the velum, or even to a slight extent into the palate-bones, the operation is rather more complicated than that above described; and though not beset with any difficulties, requires a careful examination into the anatomy of the soft palate, and some little familiarity with the operation, before the surgeon can be confident of obtaining that success, which should usually follow attempts to close a cleft palate by surgical interference.

That the edges of a wound should meet without any traction on its margin by sutures, is a fundamental rule which applies generally to all plastic operations; but especially is it absolute in any operation to close a fissure of the palate, whether in the hard or soft portion.

If a fissure of the soft palate be carefully examined, and with the mouth open the patient make an attempt to swallow, the action of the muscles of the pharynx and tongue is such, that the edges of the fissure are approximated by the action of the superior constrictors; the extremities of the bifid uvula touch, and often the gap is for an instant closed to one-third or one-half of its extent; but immediately afterwards the sections of the soft palate are drawn back to the walls of the fauces; and often the whole of the soft palate itself is so closely contracted into the side of the fauces, that a superficial observer might conclude, in some instances, that no soft palate existed. This latter effect is the result of the combined actions of the levator and tensor palati muscles contracting towards their attached extremities, and thus drawing up the sections of the velum. So that every attempt to bring the edges of the fissure together, would be opposed by these muscles, on either side, pulling away from the median line, and consequently drawing directly away from the line at which the edges of the fissure should meet to insure union.

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* *Trans. Med.-Chir. Soc.* vol. li. p. 85.

Having experienced this evil, and at once seizing on the cause of the failure, which then so constantly attended attempts to close the fissures of the soft palate, Sir W. Fergusson proposed the division of these muscles prior to the edges being brought together. In a paper published in the *Transactions of the Royal Medical and Chirurgical Society* he fully describes the method he adopted to insure this result. Since Sir W. Fergusson promulgated his views, this operation has been commonly undertaken, and, thanks to his suggestion, has been followed by a large share of success. Sir W. Fergusson recommends the division of the levator palati on either side, by cutting, with a knife bent at a right angle, behind the curtain of the soft palate. The division of the muscles is thus most effectually secured. He also recommends that the palato-pharyngeus be divided on either side. In able and experienced hands, to cut with a right-angled knife, behind the palate, where the point of the knife is out of sight, is a simple matter; but there are few surgeons unaccustomed to these operations, who feel at ease in using such a knife in such a situation. Having observed this, it occurred to the author, some few years back, that the levator muscles could be as readily divided by cutting through the palate. The experiment made on the dead body at once proved the extreme feasibility and facility of thus being able to divide these muscles; since then every case which has come under his care has been thus treated, with the most satisfactory results. The method of procedure is very simple. First a suture is passed through one section of the soft palate at the nce of the soft palate, internal, and a very little posterior last molar tooth. Running the knife upwards and back- and somewhat inwards, the point may at last be seen in p, having passed through the entire thickness of the soft , and having cut, if not wholly, at any rate partially, gh the tendon of the tensor palati : the knife should now ve most of the fibres of the levator. If the handle of the be next raised, the point becomes depressed; and if the be drawn forward, while it is at the same time made to wnwards, it travels through a considerable section of a on the posterior surface of the palate, and insures the n of the greater portion of the levator palati. As the blade travels downwards, the tension of the palate gives nd often the division of the muscle is felt to be suddenly d ; the ligature being no longer pulled upon by it, though us to division it will be felt sensibly and spasmodically cting. As the knife is withdrawn through the wound, vision of the levator muscle should be thoroughly effected. ound, in the front of the palate, need be no more than idth of the knife; whereas the wound behind is neces- much longer, for the fibres of the levator have there to be d by the sweep of the knife. Provided the muscle be ally divided, as soon as the knife is withdrawn it will be that all voluntary and involuntary movements of the have ceased; it has become pendulous and flaccid; pulling ow should produce no spasmodic contraction of its fibres. d any resistance still be observed, the knife must be again uced through the anterior wound, and the fibres a little already used will answer for this purpose; and there appears this advantage in the above method of operating, that *one knife suffices for the entire operation.*

Great care is requisite to free the edges sufficiently of their mucous covering: it is better to remove a little more than requisite, than an insufficient quantity; for the success of the operation is not interfered with in the former case, whereas the operation will most certainly fail to some extent in the latter condition.

Though Sir W. Fergusson recommends the division of the palato-pharyngeus muscles, the author has of late satisfactorily operated on several clefts of the soft palate, without having divided those muscles or touched them with the knife.

The completing stages of the operation consist in passing the sutures through the flaps, and securing their edges in contact with each other, until union has been efficiently established. Two or three fine curved needles, on rather long handles, should be ready-armed with fine white silk, slightly waxed; as soon as one needle has been used, it can be again armed, while another is in the hands of the surgeon. It is best to decide at first how many sutures may be requisite; and also to observe carefully the points at which they should be introduced; that when all are passed, their positions in each half of the palate may correspond, in distance, from each other, as well as in their distance from the margin of the wound; and also that those on one side should be directly in line with those opposite. The sutures, in each needle handed to the operator, should be at least a yard in length; and each suture should be doubled, for its whole length, before being passed. The surgeon, with the needle in the right hand, and a pair of long spring-forceps in the left, should now push the point of the needle through the soft palate (on the patient's left side) as near to its anterior margin as practicable; for although this, the highest suture, is not intended to approximate the edges of the cleft so that they should touch, still, by slightly assisting to narrow the cleft, it adds much to the utility of the one below, when the operation is completed. For the reason stated the upper suture should be passed rather near to the palate-bone.

The point of the needle having been passed through the palate, should now be pushed inwards, until it becomes visible through the cleft: one thread of the suture is then to be seized with the forceps, and gently drawn forwards, *through* the fissure and out f the mouth; the needle should then be withdrawn, care being ken that the suture is left running through the palate, and ch end secured outside the mouth. The second needle should ow be introduced on the opposite side, in exact line with that n the left. When the point appears in the gap, the silk should e seized with the forceps; and *on this side*, in drawing out the uture through the fissure, care must be taken by the surgeon o draw out *the entire loop*, and not simply one thread of the uture, as on the opposite side. The loop must be drawn for-ards gently, until secured by the fore-finger of the operator, hen the needle may be disengaged from the rest of the suture. here should then be on one side through the palate a single uture; on the opposite a double suture, the loop of which orresponds to the inner side of the fissure. The *inner* end of he single suture is to be passed through the loop of the double suture a short distance, and the ends of the latter gently pulled, until the whole double suture is withdrawn from the palate, and with it has pulled into the corresponding portion of the velum half of the single suture; and this now should lie across the fissure, with each end passed through a section of the soft palate. These ends of the suture should be secured outside the mouth, until all the succeeding ones, as many as may be required, are placed and secured in a similar manner. One is usually required for the lower portion of the uvula.

As soon as the requisite number have been introduced, each should be separately tied; carefully, so as to adapt the edges evenly to each other; and not too tightly, that room be allowed for subsequent swelling of the soft tissues. If the sutures be tightly drawn, they most certainly will cut themselves out by producing ulceration of the part through which they pass. A slip-knot to bring the edges together, and a second knot over that, are sufficient to secure the suture, and maintain apposition until union is safe. The ends of the sutures should not be cut off very close to the knots: otherwise, when the silk becomes thoroughly sodden with moisture, the knots are almost certain to become loosened or untied in a very short time, and much too soon for safety.

Mr. Callender has recommended the division of the muscles a day or two prior to an attempt being made to close the palate; thus the operation is divided into two stages. He urges, and with good reason, that by dividing the muscles on one day, and paring the edges of the fissures and passing the sutures on a subsequent one, the second operation is much simplified by the freedom from that bleeding which takes place whenever the muscles are divided at the same time that the cleft is pared and the sutures passed.

Mr. T. Smith's method of operating is, first to pare the edges of the fissure from below upwards, then to pass the sutures, and lastly 'to draw up the palate with all the sutures in one hand, and with the palate on the stretch to divide, if necessary, the palato-pharyngeus, and subsequently the levator palati; if the palate will not come easily together, two lateral oblique cuts may be made, one on either side above the highest suture, separating the soft from the margin of the hard palate to a small extent.'*

The operation for closing the hard palate is a very different proceeding to that described as requisite for the relief of fissure of the soft portion. The result of some experience confirms the opinion long entertained, that, when fissure of the hard as well as of the soft palate co-exists, the attempt to close the entire fissure in one operation is not advisable. Separate operations, at some short intervals, should be had recourse to, so as to close either the hard or soft portions first, and the remaining portion subsequently. There are several cogent reasons to render such practice generally desirable. In the first place, an attempt to close a fissure of the hard and soft palate at once entails a long and painful operation on the patient; and as he has to keep his mouth open while the operator is at work, it becomes a most tiring and irksome effort, if the period is a prolonged one. In the second place, the loss of blood which will often occur, in an operation on the hard palate alone, is sometimes considerable; often apt to make the patient faint, and so prolong the completion of the operation. But should the attempt be made to close the hard and soft palate at once, the loss of blood is usually much greater, and often too great to allow of perfect success in the attempt. In the third place, when an attempt is made to close the cleft in one operation, the edges of the soft tissues both in front and behind are apt to ulcerate, and often to slough.

If the soft palate be alone operated on, some ulceration may and does often supervene; but it is rarely of such consequence as to be ultimately of any importance, provided the palate has not been unnecessarily bruised or cut about. Under the circumstances above alluded to, the integrity of the tissues covering the hard palate contributes largely towards the nutrition of the somewhat injured soft palate; but if a large portion of the attachment of the soft tissues covering the bone be interfered with by their separation from the latter, not only is their intrinsic nutrition greatly reduced, but they can, by so much the less, aid in preserving the vitality of the soft palate, while its union and reparation are becoming established. If, however, the soft palate be first selected for closure, and the operation be successful, the union of the flaps converts the anterior portion of the fissure into a foramen; and *pro tanto* aids in the nutrition of the soft tissues of the hard palate, when they are detached from the bone, at some subsequent operation; or if the hard palate be operated on first successfully, so much is gained in front, to assist in the nutrition of the soft palate, when it comes under the knife of the surgeon. As before stated, the operation on the soft palate aids to contract the gap left in the hard palate, even without further operation; and this will be observed in the adult, but especially in the child.

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* *Trans. Med.-Chir. Soc.* vol. lii. p. 84.

Complete fissure of the hard palate, or one extending to or near the alveolus, is generally closed without much difficulty. The most simple method of detaching the soft tissues from the bone, and of forming the flaps which are to close the gap, is first to make the lateral incision, on either side of the cleft. This incision should be close to and parallel with the alveolar ridge, and extend from a point opposite to the last molar forwards to the canine tooth. The flaps may now be separated from the bone by an instrument with a somewhat broad and rather blunt edge slightly curved inwards. The separation should be commenced from the incisors and proceed inwards, terminating when the edge of the gap is attained. The separation can be quickly effected without much risk of bruising the flaps; or the soft tissues may be separated from the bone, by the operator commencing at the edge of the cleft and dissecting outwards. Of late we have, however, adopted the former method of proceeding, and find that the separation of the flaps from the bone can be more readily and effectually accomplished, with less risk of bruising, or cutting through the substance of the flaps. This is a matter of great moment for the ultimate success of the operation; for should the flaps be much bruised or torn in the process of their separation from the bone, ulceration or sloughing is most apt to supervene and materially interfere with the union requisite to the success of the operation.

The flap detached from the bone should consist of all the soft tissues covering the latter—mucous membrane, areolar tissue, and periosteum. If the soft tissues are separated from the bone in the manner recommended, on the dead body, it will be found difficult (and we conjecture equally difficult in the living subject) to peel off the thick mucous membrane without the subjacent periosteum. The operation which Professor Langenbeck proposed, and to which he gave the name of 'the operation by muco-periosteal flaps,' appears to be identical with the method of operating introduced by Mr. Avery.*

Mr. Annandale † has succeeded in closing fissures of the hard and soft palate by the adoption of lateral incisions merely, and without the division of the muscles of the velum, either in the manner adopted by the author or that which has long been recommended and practised by Sir W. Fergusson. But in the cases related by Mr. Annandale he carried the lateral incisions back some way into the substance of the soft palate. His results were perfectly satisfactory—so much so, that his method of operating in extreme cases of fissure may probably, upon more extensive trial, supersede those already described and at present most commonly adopted.

When the soft tissues have been effectually separated from the bone, the flaps should fall inwards and downwards and meet in the median line, without the slightest traction being requisite. If the edges do not readily touch, the flaps have not been sufficiently detached from the bone on one side or the other; and care must be taken to ascertain the point which prevents their sufficient descent, and this should be freely liberated; nothing must be allowed to interfere with the free approximation of the edges.

When the fissure is extensive, and more or less complete, the free separation of the soft tissues from the bone is amply sufficient to allow the margins of the flap to meet easily in the median line; occasionally they will overlap; in which case, the edges require to be carefully adjusted. They should be carefully pared with a sharp knife, so that if a little ragged, they are made even; and the possibility of any mucous surface becoming insinuated between them be avoided, and the contact of two entire and fresh raw surfaces be insured. The sutures are to be passed as already described. There is often some trouble experienced in passing them through the anterior part of the palate; but care and patience will usually overcome any difficulties which may present themselves.

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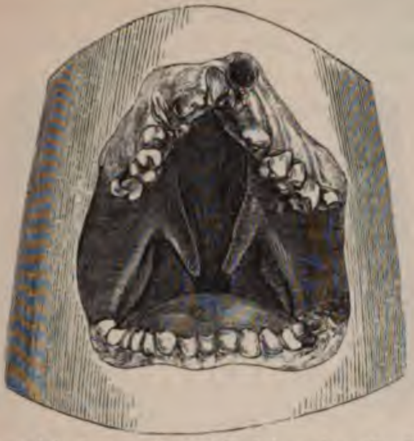
* See Prof. Langenbeck's treatise entitled *Weitere Erfahrungen im Gebiete der Uranoplastik mittelst Ablösung des mucös-periostalen Gaumenüberzuges.* Berlin, 1863.

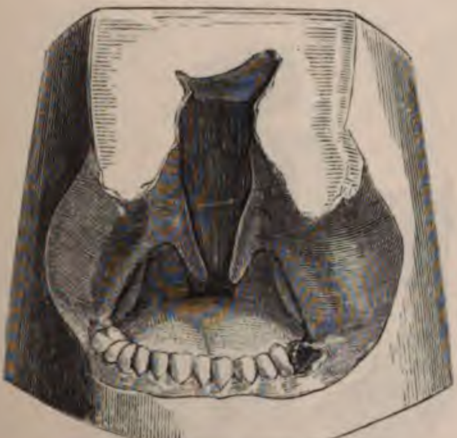
† *Edin. Med. Journ.* 1865, vol. x. p. 621.

Fig. 247.



Drawing from a model of a complete cleft of the palate (St. George's Hospital Museum).

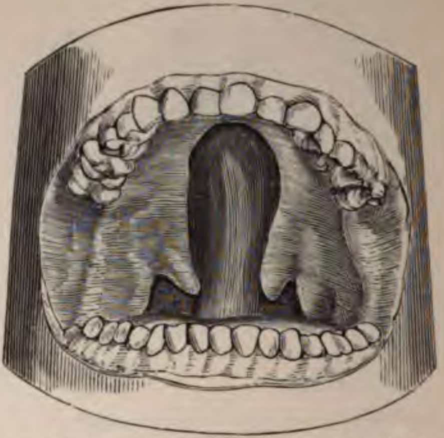
Fig. 248.



The same model cut in two to show the perpendicular direction of the sides of the gap.

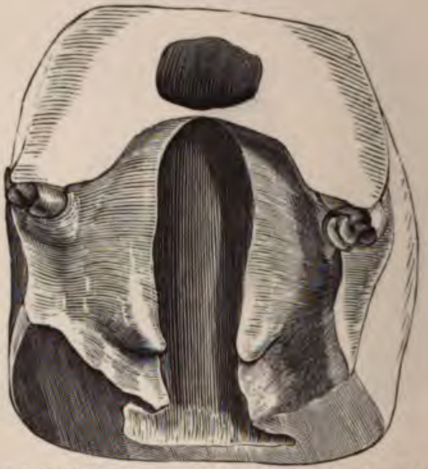
When a fissure of the hard palate is complete, or nearly so, the sides of it will be found to approach more or less to the perpendicular in their direction, as is shown in Figs. 247, 248. The result is, fortunately, that when the soft tissues are sufficiently detached from the bone, the flaps fall inwards and downwards, and readily meet in the median line; there is always ample material to permit of their arching over the defective roof, when they are once liberated from the bone.

Fig. 249.



Drawing from a model of a partial fissure of the palate (St. George's Hospital Museum).

Fig. 250.



The same model divided, showing the much more horizontal direction of the sides of the gap.

But when the fissure in the bone is confined to the posterior alf, the portion of the palate in front of the fissure, and what-ver portions of the palate-processes exist as its sides, will be bserved to approach, in curve, the arch of a perfect palate as en in Figs. 249, 250 taken from the model of a cleft of this ind; the bony fissure will often be broad, and rounded in front; nd the membrane covering the bones very thin. In such cases, the soft tissues are merely detached from the bone at the sides nd front of the fissure, there is not much spare surface to close e gap; consequently the edges of the flaps do not meet in the edian line, so readily as occurs when the tissues are detached om the more upright sides of more complete fissures. Often, owever, a fissure of the posterior half is narrow, pointed in ont, and its sides covered with thick velvety mucous membrane. nder such circumstances little difficulty is experienced in etting the edges together.

When cases with broad fissures of the posterior half of the ard palate are operated on, it is generally necessary to make teral incisions through the soft tissues, parallel with the ges of the fissure, and close to the alveolar edge. The soft ssues between the incisions and fissure must then be separated om the bone; but great care should be taken not to injure e anterior or posterior extremities of these flaps, or in any ay damage their connection in front and behind; the flaps ust then be fastened together with sutures. Sometimes it ill be found desirable to plug the incisions with a little soft otton: this helps to push the flaps towards the median line, nd takes off some of the traction of the sutures; this traction eing almost unavoidable in instances in which the gap is an nusually broad one.

Such cases as the latter are the most unsatisfactory to deal ith. In some instances it will be found best to close the soft efore attempting the hard palate; for experience has taught s that the continued action of the muscles of the soft palate, losed by operation, has always a tendency to contract any pening left in the hard palate.

If the gap left should appear too large to be benefited by a subsequent operation, it would be better that the patient hould use an artificial palate; at any rate, until from lapse of time the ultimate benefit of the first operation can be estimated.

It frequently happens that, under the most favourable circum-tances, and with the greatest care on the part of the operator, a small pin-hole aperture, or fissure enough to admit the flat end of a probe, will remain at the meeting-point of the hard and soft palate. Under such circumstances a metal plate should be worn for a period, *over the opening*, to prevent the percolation of saliva and other fluids through it. Under such treatment it has a tendency to close. But if any substance, such as a plug, &c., be made to project continually *into the opening*, and thus press on its margins, it will invariably and gradually increase in diameter; in time the plug will become useless, and must be replaced by a larger one, and this will be followed by progressive increase in the size of the aperture.*

If it should happen that a patient, with hare-lip and cleft alveolus and palate, should not have had the lip operated on in childhood, it will, in all probability, be found that the cleft of the alveolus is considerable,—sometimes sufficient to allow the point of the finger to be passed through it from nostril to mouth. Under such circumstances the first care should be to operate on the lip. It will be found, subsequent to the healing of the lip, that the action of its muscles, in a very short time, will have approximated the edges of the separated alveolar ridge, often so as to make them touch; though, in consequence of the interposition of the mucous surfaces, the chink between them never appears to be obliterated, unless the mucous membrane be removed.

Occasionally small orifices are met with in the palate, either congenital, or more frequently the result of some cachectic or syphilitic condition, terminating in necrosis and destruction of a portion of the bony palate. In either condition, some little difficulty will usually be encountered in attempts to close such ifices. In all instances, lateral incisions are requisite; and repetition of the operation may be necessary, even more ian once, before entire closure be effected. But, under any rcumstances, should the opening be not ultimately filled up, will generally be greatly reduced; so that the patient will e enabled, with the aid of an artificial palate, to secure him-elf from the discomforts attendant on a perforation of the oof.

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* The author would not be doing justice to the memory of the late Mr. Avery, in omitting to mention that he was the first surgeon in this country to close entirely a complete cleft of the palate. Since then the operation has been frequently and successfully performed in England and on the Continent. To Dr. Warren, of Boston in North America, the profession is chiefly indebted for having advocated the closure of the hard palate by operation. In the *New England Medical and Surgical Journal*, and also in the *American Journal of Medical Sciences*, as early as the year 1843 (also in 1848), Dr. Warren gave the result of his operations on fissures of the hard as well as the soft palate. Although complete closure does not appear to have been effected in any of these cases by *one* operation (which Dr. Warren appears always to have had recourse to, to close both hard and soft palate), yet his success by subsequent treatment in the management of these cases marks him as one of the pioneers in the advancement of this department of Surgery.

Orifices through the soft palate are usually, if not always, the esult of ulcerative action. Generally they close after a time, ithout the assistance of an operation. An opening, the result f strumous ulceration of the soft palate, and of the size of a ixpenny-piece, in a patient under the care of the author, con-racted and closed entirely, after cicatrisation of its margins had occurred, without operation or any surgical treatment. When, however, such an opening ceases to contract, and holds out no prospect of natural obliteration, but promises to be permanently patulous, its edges should be pared, lateral incisions made, and the margins brought together and retained in apposition by sutures.

The amount of blood lost during the performance of an operation on the palate will vary to a very great extent in different cases; but usually much more is lost in the process of detaching the tissues from the bone, than in the operation on the soft palate. The anterior and posterior palatine vessels sometimes bleed profusely after division; so much so, that occasionally it becomes necessary to make pressure for a few moments or more, with the finger; especially on the anterior, which generally bleeds more profusely than the posterior vessels. Iced or cold water should be used frequently, to wash out the mouth during the operation, when hæmorrhage is free. The loss of blood in no one operation, under the experience of the author, has been attended by evil consequences. Women are often apt to faint from a small loss of blood, when added to the fatigue of the operation. In one instance which occurred to the author, the operation was obliged to be completed while the patient was lying on the floor.

It is advisable and often necessary, to administer stimulants liberally to the patient during the operation, not only to endeavour to obviate the effects of the loss of blood; but also to encourage one who flags in determination.

The patient should always be provided with his usual meal previous to the operation. For some days after, *he must be plentifully supplied with nutritious fluid and soft food*: strong beef-tea, bread and milk, tea with half milk or cream, strong soup, and beer or wine. From the first hour after the operation, strict attention to this rule forms an important element in the satisfactory union of the flaps.

It might be supposed by some, who have not experience in this class of cases, that, after an operation on the soft palate, the effort of swallowing would be an effective impediment to union, in consequence of the action of the muscles of the palate; but it must be borne in mind, in the first place, that, prior to the operation, the palate-muscles had no power in themselves to assist in the act of deglutition; they could not close, between the ori-nasal cavities, on the passing food; in fact, that the process of deglutition is initiated in the back part of this ori-nasal and pharyngeal cavity, by the extremely educated action of the superior constrictors of the pharynx. In the second place, the divided, and to an extent crippled, muscles of the palate are naturally passive in deglutition until reparation is established and complete. So, in practice, it is found that, as long as a patient is restricted to soft or fluid articles of nutriment, union is not retarded by the mechanical action of deglutition, however often he may be fed in the day. But if all diet be withheld, the patient's strength, already lessened by loss of blood, becomes lowered to such an extent, that reparation is rendered doubtful, and union of the parts is retarded, if not ultimately prevented. All hard food should be avoided for a week or ten days; such as solid meat, potatoes, dry bread, &c.

The sutures should not be permitted to remain in the flaps many days. Usually, in the soft palate, the two lower ones should be removed on the second day; and if there be four sutures, one of the two latter should be taken away each succeeding day: that which is highest, to be last removed. It has been supposed desirable to retain the sutures in the flaps for a longer period; but in each fresh case that comes under our notice, it becomes more evident, that if union is satisfactorily established, the retention of the sutures beyond the third or fourth day only tends to render it less effective: and if the condition of the edges of the approximated flaps is not satisfactory, and their union is not firm, the presence of the sutures will aggravate rather than diminish the evil.

The patient should not be allowed to speak until union is complete, and the sutures are removed. He should be provided with materials for writing all his wants; a small slate and pencil will be found most convenient for such a purpose. It is not requisite to confine the patient to bed after the operation; but in some instances individuals prefer to lie still for a few days, especially if they feel weak from the loss of blood. The condition of the tongue, before or after the operation, must not be taken alone as indicative of the patient's condition. All persons afflicted with cleft palate are liable to a dry, rough, and often coated tongue—the result of the constant passage of air in respiration over the surface opposed to the fissure. The injury, from the operation, to the soft tissues of the roof, generally sets up a slight degree of feverish excitement, with a very coated tongue for a few days. This condition of tongue must not be taken to indicate the want of purgative medicine. In an instance under the author's notice, this state of the tongue was mistaken for a symptom of some great general disturbance of system, and to remove it, two consecutive doses of calomel were administered within four days of the operation: the patient became salivated a week after the operation, and the wound, which had been most satisfactorily united, gave way entirely under the salivation.

We cannot too strongly urge the point that, previous to any operation for the closure of clefts of the palate, the surgeon should satisfy himself, that the patient is in a condition of health to justify the expectation, that '*union by first intention*' will follow the adaptation of the raw edges of the flaps to each other. The success of the operation depends on immediate union of the edges: if they do not unite at once, there is no hope that they will do so secondarily, when in the stage of granulation. We ought to be most particular not to recommend an operation, should the patient show any sign of disordered health or defective power—pustules, herpes, excoriated lips or nostrils; in fact any indications, trivial in themselves, and perhaps of no import in the balance which influences other operations, should in cases of cleft palate be decisive against operative interference until a clean bill of health can be written for the patient.

The particulars of the following case illustrate the importance of such a precaution. The author operated on a young lady ten years of age and apparently in perfect health, for fissure of the soft palate. The operation was most satisfactory in its immediate results, the gap being entirely closed. The parts looked perfectly united on the second day; on the third day, the little patient was attacked with scarlet fever, and in a few days after, the whole line of union had entirely given way. The parents had brought this child from the country a few days previous to the operation, but had left another at home recovering from the effects of scarlet fever; and, of this circumstance not one word was mentioned until after the appearance of the eruption subsequent to the operation.

It may be asked, what amount of improvement in articulation and speech is effected by the operation, in patients who successfully undergo it. Dr. Warren states: 'There is generally more facility of speech, which, so far as it has been in my power to watch patients at a distance, is constantly improving. A young man was present at a meeting of the Boston Society for Medical Improvement, about two years after the operation, and it was difficult to discover the least imperfection in his speech, although it had previously excluded him from society.'*

The author has found that in many cases the improvement has been most marked and satisfactory; and, in almost all, sufficient to render what was unintelligible readily comprehended: in one case, a stranger could not have detected a defect in articulation, on the delivery of a long sentence, three years after the closure of the entire palate. In all cases time is requisite, and much pains must be taken by the individual, to acquire the power to articulate clearly such letters and words as, without a roof to the mouth, the tongue cannot command. It becomes, in fact, a task to the patient to learn how to pronounce correctly and distinctly a new dialect. The condition of the upper incisors is often very defective in these cases of cleft palate: always more or less so when the cleft has extended through the alveolar ridge. Such cases should be placed in the hands of an experienced dentist, when the surgeon has terminated his work; for this irregularity of the teeth will often form a complete impediment to the improvement in articulation, although the palate may be most satisfactorily closed. The substitution of artificial teeth in front, in place of the defective ones often found in these cases, is not only of considerable assistance towards improving the power to articulate more distinctly, but also materially lessens a deformity so long a prominent feature in such patients.

It would be invidious to the task the author has undertaken, in writing this article, as well as deficient in respect to those who have devoted attention to the subject it refers to, were he, in conclusion, not to mention the names of Roux, Cloquet, Mettauer, Mütter, Pancoast, and Dieffenbach, with those of Warren, Avery, and Fergusson. Each has so far aided in turn, to improve this once apparently difficult and almost hopeless operation, that it can now be confidently looked upon as certain to effect closure of the most extensive cleft, and almost certain to improve thereby the most defective articulation.

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* *Amer. Journ. of Med. Sc.*, April 1848.

DISEASES OF THE LIPS.

The congenital defects of the lips and of the mouth, and the treatment applicable to each, are described elsewhere in this work; as also the diseases of the tongue, and their treatment. In the following section will be described the diseases of the lips, jaws, and floor of the mouth.

The diseases of the lips are usually so marked, that they greatly affect the appearance of the individual; and they are often so serious, that they demand the most careful attention of the surgeon.

Simple '*cracked lip*,' when superficial, may be the result of long-continued cold weather, acting upon a constitution somewhat out of order. The crack is usually near to, or at the middle of the lip; is not deeper than through the mucous covering; is often excessively painful when stretched, and readily bleeds if its edges be accidentally and suddenly separated. It may generally be relieved by slight attention to constitutional measures; an alterative, with aperients, if requisite, or such other remedies as the condition of the patient may indicate. The application of caustic will often relieve the pain at once; and some simple salve constantly applied keeps the surface soft and supple, and prevents its edges from getting dry and tender.

Should such a slight but painful crack be neglected in early life, and no measures taken to relieve the patient of this troublesome recurring sore, it will often happen that the crack deepens, and becomes more permanent in character: it becomes located in the part; and appears sometimes so deep, that it might be supposed that the middle line of the lip had been grooved out by ulceration; a very unsightly furrow, occasionally of considerable depth, is thus formed, to the great deterioration of the personal appearance of the individual. Under such circumstances, the relief, which in former years would have been readily in treatment is dependent, in a measure, on the amount of the diseased structure. The nævus may be but a small red superficial patchwork of vessels; or it may be a large soft spongy cluster of veins, spreading over a very large section of one side of the face. The small arterial bright vascular patches are most common; though often a very large spongy venous nævus on the cheek may be observed in very early life.

When a small arterial nævus occurs on the margin of the inner surface of either lip, and is entirely superficial, it may be disposed of in several ways; but the application of the ligature is the most rapid, the most certain, and not more painful than any other. A needle passed through the base, and a fine ligature tied under the needle tightly round the mass, rapidly and surely effects its removal. In the course of a few days the slough will have separated; and in a few more, the wound, which at first may appear formidable after the removal of the slough, quickly contracts and cicatrises.

If the diseased mass of vessels is larger, and dips into the substance of the lip, and has not spread laterally, but involves more in depth than in breadth, it may become a question whether it would be better to cut out the diseased mass, as in an operation for cancer of the lip, or to destroy it by the repeated introduction of ligatures through its substance, tied tightly, so that the mass be cut up into several pieces. If the mass involves the whole thickness of the lip and the corresponding surfaces of mucous membrane and skin, and, though extending towards the root of the lip, does not spread laterally, and can therefore be readily removed by incision, there are reasons for such treatment being preferred. The disease is at once got rid of; the relief is effectual; the operation is simple; the recovery is quick; and the scar left after union is but slight. The only precaution requisite in the performance of such an operation is to take care that the incisions are made through healthy tissue, and beyond the diseased vessels. The margins of the wound are to be brought together, as in the operation for hare-lip.

But rather than sacrifice skin or mucous membrane, if either or both are much implicated, it is far preferable to have recourse to ligature: if the disease spreads laterally, or extends in any degree into the cheek, ligature alone must be used.

Under the circumstances of ligatures being applied to such nævi of the lips and cheeks, it should always be borne in mind that scar must be avoided as much as possible, and mucous membrane saved as much as can be. The one is an eye-sore; the loss of the other is apt to produce distortion of mouth and a contracted cavity. Therefore, in using a ligature for nævus of the face, it is best to pass the thread entirely subcutaneously, and to tie it at the common point, where it entered and emerged from the skin, so that no portion of the latter be destroyed. One ligature may be sufficient in slight cases; but in others several may be requisite to completely obliterate and destroy the diseased structure. The object to be kept in view in introducing the ligatures, is to effect the entire division of the diseased mass of vessels in several directions,—that, in fact, they be cut into several pieces; so that if, in the first instance, a ligature be introduced round a portion of the tumour, in the second operation one should be passed across; that each ligature should act on a fresh part; that ultimately the original mass may be divided into so many portions as will insure the consolidation of all the diseased tissue.

If the ligature be introduced on a needle at one point, and carried partly round the mass subcutaneously, and brought out at some distant point,—again introduced and carried in or through until it reach the original puncture, and the ligature then tightly tied at this opening,—no skin need be destroyed, or mucous membrane cut or damaged. Each ligature should be tied as tightly as possible. It will soon cut its way free. The ends of the ligature should not be left too short; otherwise they may become buried in the wound in the subsequent swelling of the parts, and probably would cause suppuration to a greater extent than desirable, or even occasion some difficulty or delay, from being retained in the wound. The more tight the ligature is tied, the more speedy will be its release from the tissues which it grasps.

Vaccination should only be tried in very small nævi; the introduction of caustics, setons, the injection of perchloride of iron, each have their advocates; but none of these secure more effectual obliteration of the nævus than the ligature: they often fail to secure it as rapidly; they often set up more irritation than is requisite for the purpose in view; they sometimes cause the skin to slough; and they are more painful in adoption, inasmuch as, being slower in action, their application must generally be often repeated before a satisfactory result is insured. The galvanic cautery has often been employed by the author; but after a great number of experiments in the treatment of such cases, he is satisfied that subcutaneous ligature will invariably be found quickest in action, most effectual in result, least objectional as regards scar, and, so far, less painful than any other kind of treatment. This is the case whether a nævus of the lip be large or small; unless the case be more suitable for the knife.

Cancer of the lip may be said to be confined to the lower lip, it is so rare in the upper: it is certainly more frequent in males than in females, the proportion being relatively large in the stronger sex.

The characteristics of cancer affecting the lip deserve particular attention. As a rule, we may say it is found to consist of the epithelial variety.

'Epithelial cancer has its primary seat, with very rare exceptions, in, or just beneath, some portion of skin or mucous membrane. Its most frequent locality is the lower lip, at or near the junction of the skin and mucous membrane.'* Commencing sometimes as a small warty growth on the lip; sometimes as if the mucous membrane were excoriated, with the excoriation resting on an inflamed and thickened base; sometimes as a small, indolent tubercle: the condition, which does not at first excite suspicion, by degrees is seen to alter and the growth to increase. The wart grows in breadth and thickness; the excoriation becomes deeper, and rougher on its surface; the tubercle peels and ulcerates, scabs and peels again; until, sooner or later, the persistence of the mass, or the heat and pain of the part, attracts the more serious attention of the patient, and he then seeks for relief.

It is unnecessary here to enter upon the question of the pathology of cancer, or of its cachexia; the subject having already been discussed in the essay on CANCER, Vol. I.

We pass on at once to the consideration of diagnosis and treatment.

The diagnosis of cancer of the lip may at first sight appear simple enough; and yet a certain degree of caution must be observed, ere an opinion be definitely arrived at, as to the precise character of a hardened sore, or of a raised tubercle of the lower lip. It has occurred to the author, and no doubt to many others, to point out, that a previously supposed cancer of the lip was but a chancre : a chancre of the lip has been mistaken for the more serious malignant sore. The surface under both conditions may be superficially excoriated; the lip may be thickened at the part; the sore may rest on a hardened base; and there may be the additional suspicious circumstance of attendant enlarged glands in the submaxillary region. It must, however, be borne in mind, that cancer of the lip is somewhat slow in its progress; that the cervical glands do not usually indicate the more grave implication of the constitution at an early period : whereas in chancre the glandular enlargement would be apparent in six or eight weeks, at the latest, from the first appearance of the sore; and probably, if no specific treatment have been adopted, other evidences of secondary symptoms, such as eruption, sore-throat, &c., would be manifest within six weeks of the first infection. As a mistake in diagnosis between cancer and chancre of the lip has often being known to occur, a few remarks, in passing, on that subject will probably not be thrown away.

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* Paget's *Surgical Pathology*, vol. ii. p. 412.

Cancer of the lip is a disease of advancing, if not of advanced life; but man is often depraved, and experience teaches us that age need not be taken as a bar to the occurrence of a chancre of the lip.

A gentleman past the meridian of life, and on whose head time had more than showered a few snowflakes, applied to the author with a condition of lip which had excited suspicions as to its cancerous character. The appearance of the sore itself was extremely deceptive; scattered and isolated glands, slightly enlarged, and hard, were to be felt in the submaxillary regions; and his position and circumstances in life rendered it most improbable that a chancre could have been contracted on such a part. This sore was found to be accompanied by a commencing faint lichenous eruption. The patient was put under a mild course of mercury, and rapidly recovered; the hardness at the base of the sore entirely disappeared.

The characteristics of the two affections may thus be summed up: chancre of the lip may occur at any period of life, and is as often seen on the upper as the lower lip. Youth is the most probable period of the infection; and we say, with regret, it is most frequently observed in women: it sooner or later forms a superficial sore, raised on a base of an almost cartilaginous consistence: the surface appears more like an excoriation than an ulcer; or the surface may have cicatrised and the hard base remain. The glands of the submaxillary spaces enlarge at an early period, some six or eight weeks after the sore commences; and though hard, small, and scattered usually, they sometimes attain a large size. In one instance which came under the author's notice, the glands on the right side were very much enlarged, and on the inside of the right half of the lower lip was a large hard mass of cicatrix, the original sore of which had entirely healed some weeks previously. Secondary symptoms will sooner or later appear, unless early treatment be adopted.

Cancer of the lip is a disease of advanced life; affects the lower lip mostly; is most frequent in men; does not progress uniformly, and usually slowly; does not implicate the absorbents at so early a period as chancre; does never thoroughly heal up and cicatrise like chancre. The disease is usually of the epithelial variety of cancer, and varies a good deal in its method of commencement, in its progress, its growth, and its appearance; while the characteristics of chancre are uniform in most persons. Cancer always contaminates the absorbents, if allowed to run its course unchecked; ultimately it destroys, locally, all tissues in contact with its surface; the whole lip may be affected; large cancerous masses exist, at the same time, from the symphysis to the clavicle; and death ultimately follows.

The treatment of cancer of the lip usually resolves itself into removal by knife, or destruction by caustic. In the opinion of the author, it should entirely resolve itself into that of the knife; and the earlier such treatment is adopted, the better the prospect of prolonging life.

The surgeon having decided to remove a cancer of the lip with the knife, the patient should be seated in front, with his head steadily supported by an assistant; or he may lie on a sofa. If the disease occupy but a small portion of the lip, the mass may be removed entirely by a V-shaped cut through the healthy structure. The lip may be transfixed with a thin straight knife, and then cut upwards on either side of the diseased tissue; an assistant should hold the flaps as they are liberated from the diseased part. The flaps are to be brought together with pins and the twisted suture, or by sutures alone; care being taken that the margins of the prolabium, or mucous edge, be accurately adjusted. One, two, or three pins may be requisite; some surgeons prefer sutures without the aid of pins; and silver sutures answer the purpose very satisfactorily. If pins be used, as soon as they are fixed by suture, the sharp-pointed ends should be cut off, and the remaining ends so protected that they be not readily caught by the dress, &c. of persons in attendance, otherwise the patient runs the risk of being accidentally very much hurt, for want of a little foresight. In all these operations the pins or sutures should be removed at the end of forty-eight hours at the latest, and the wound supported by adhesive plaster.

If a large surface of the lip be affected, and the disease be superficial, it may be readily removed by a semicircular sweep of the knife, or a cut with a pair of curved scissors; in either case the opposed edges of skin and mucous membrane should be brought together with sutures. In the incisions through the lip, the labial arteries bleed freely. With the aid of the pins and twisted suture the hæmorrhage is readily and effectually checked; with the semicircular incision a ligature or two may be requisite.

It will save some little inconvenience, and also pain, to have the sutures well oiled before they are twisted round the pins: by using this precaution, it will be easy to remove the sutures subsequently, as they are readily detached from the pins; when not oiled, they adhere to the pins and to the skin, and always occasion pain when removed.

The use of caustics, in cases of epithelial or other cancers of the lip, is but waste of time, and an unnecessary infliction of suffering; provided the disease be not too far advanced for removal by the scalpel. The knife should always be used when practicable; caustic, only when the disease is too far advanced for removal by the knife. But even then it is doubtful whether any application of caustic, by retarding growth or destroying material, compensates for the pain, often exquisite suffering, which is inflicted by its use. It is a question worthy of consideration, whether caustics of any kind act beneficially in any cancerous affections. If caustic be decided on, the most efficient is the chloride of zinc, applied in the form of a paste.

The advantages of operating early can only be appreciated when compared with the more rapid results of a case which is allowed to run its course unmolested. But under the most favourable circumstances, we can only expect the operation of removal to relieve for a time; the disease usually returns, and generally shows itself in the glands of the submaxillary region. These in time increase to a great size; the skin over them ulcerates and sloughs; an ulcerated and fungoid surface discharges profusely, and often bleeds largely: and life is thus drained away. We cannot here more fully discuss the advantages of the removal of cancerous affections of the lip; but as such affections are not ultimately amenable to any treatment, nor the disease ever eradicated by topical remedies, their entire removal offers the speediest prospect of present relief; and though such a measure should be adopted as soon as the disease is decided to be cancer, the remedy is at best but a choice of evils, and must never be held out as one of radical benefit.

Cysts of the lip are not infrequent. They are generally observed near the free border, or inner surface; usually of the lower lip. They sometimes increase to an inconvenient size. On the margin of the lip they seldom project beyond the mucous membrane; the skin is usually free. They are generally well raised from the surface; covered by very thin membrane; usually semitransparent, but occasionally somewhat discoloured and of a venous hue, as if veins traversed or opened into a cavity.* They contain either viscid clear mucus, much like the contents of the cysts termed ranulæ; or sometimes a darkish fluid of thick consistence. They are generally single, though their surface and shape may be irregular. They seldom grow large; though this may be the result of locality, as the surgeon is usually required to remedy the evil before it occasions much inconvenience, or becomes unsightly.

Such cysts are usually innocent in their character; do not recur in the part when effectually treated; nor are they congenital, unless of that variety alluded to as connected with blood-vessels. These cysts are often not larger than small peas, or from that to the size of a small walnut; painless; indifferent to being handled; and only inconvenient from size or disfigurement. They occasionally remain stationary for life; are then usually small in size, and frequently discoloured; the more transparent ones have the greatest tendency to increase, as if dependent on the secretion of a gland, which probably, having had its duct obstructed, has given rise to the formation of the cyst.

The treatment to be adopted in such cases is very simple, and usually satisfactory. The cyst should be freely divided, and its contents allowed to escape; when entirely emptied, it is best to wipe out the cyst with dry lint, and then freely apply strong nitric acid to the whole surface of the lining membrane. Though the treatment be rather sharp for the moment, the ı subsides, and the patient is then able to eat and talk No surgeon should be satisfied with simply punctur- . cysts; a puncture, or even a small incision, will y close before the cyst is obliterated; and in a few ɛcomes as large as it was originally. Even after the ɔn of nitric acid, unless the opening be free, and care keep it so, until the cyst be entirely destroyed, the ac- ɔn of fluid is very apt to recur. It is a good precaution the edges of the opening with nitric acid for a few ɛecutively, to insure its not closing until suppuration stablished, so that the cyst be obliterated. Occasion- ıt in the lip is complicated with some solid growth. wths are usually somewhat of a glandular nature,* and urable for removal. These tumours are not common. ɛmble, to some extent, the mammary glandular tumours ɛence and character; or 'they may appear intermediate the foregoing and those tumours which are found over, he parotid gland, and consist of mixed glandular and ıous tissue.'†

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* 'Cysts formed of dilated portions of blood-vessels shut off from the main stream.'—Paget, op. cit. vol. ii. p. 27.

t refers to a case removed by himself from the upper lip of a man; ɛs a second case, which occurred under Mr. Lloyd's care, in a man tumour in his upper lip for twelve years, when it was removed. ur was firm, slightly lobed, yellowish-white, smooth. In general ɛembled the mixed tumours over the parotid; but its minute struc- ed as perfect an imitation of lobulated or acinous gland-structure as ıry gland.' ‡

ɔf the mouth may be congenital, or the result of ob- lucts; ranulæ; or possibly bursæ between the muscles ıgue.

ıital cysts of the mouth are not frequent, though they iciently often to be familiar enough to surgeons. Mr. ıwkins long ago drew attention to their real character. uch cysts are single, and may increase to a large size; ıay be multilocular and numerous, and occupy a con- portion of the floor of the mouth. Whether single or l, they will usually be found between the lower jaw and ıe; if large, pressing the floor of the mouth forwards ırds, and the submaxillary soft tissues outwards and ls.

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pecimen, see Museum of St. George's Hospital; referred to also by
vol. ii. p. 73
vol. ii. p. 262. ‡ Ib. p. 263.

An infant three weeks old was sent to the author by Mr. Frank Buckland, then assistant-surgeon of the Second Life-Guards. The mother found that the child suckled with increasing difficulty during the last few days, in consequence of a swelling on both sides of the floor of the mouth, which was pushing up the tongue, and had much widened the lower jaw. It had also encroached backwards so as to press somewhat on the larynx and pharynx; respiration was somewhat impeded; deglutition was slow and difficult. Under the tongue and on both sides of the mouth there projected a lobulated irregular cystic mass; some portions of which, especially on the left side, were so prominent, that the tongue was pushed upwards by it, and the tumour bulged out between the tongue and the lower jaw, to such an extent, that the infant could not close its lips. An irregular lobulated swelling projected on each side of the throat, immediately below the lower jaw.

The cysts projecting between the tongue and lower jaw were thin and pellucid, the membrane covering them pale-coloured, and free of vessels on its surface.

A seton passed through a cyst on the left side soon allowed it to collapse; a thin purely transparent fluid oozed out through the punctures. On other days other threads were passed through some of the more prominent cysts, while some were punctured. The partial reduction of the sublingual swelling enabled the infant to partake more freely of food, and for some days a slight improvement was observed in his condition. This was but transient; evidently other and deeper cysts became larger; gradual increase of dysphagia and dyspnœa supervened; and the infant died, greatly emaciated, the sixth week after its first visit to the hospital.

On examination, it was found that this cystic formation involved all the tissues between the mucous membrane of the floor of the mouth and the skin covering the submaxillary region; so that not only did the mass of cysts (it might be termed a multilocular cystic tumour) project upwards in the mouth, but downwards on both sides, in the submaxillary spaces. On a section of the tongue, the whole muscular structure was seen studded with cysts; small and millet-like in some parts, rather larger in others; some single, others multilocular. The larger ones were generally multilocular, with bands running across and around their walls.*

Other forms or characters of cysts are occasionally observed in the mouth, sometimes between the gum and the cheek.

Mr. Paget describes a case of this nature, which occurred in a woman, in whom a soft elastic swelling pushed out the thin mucous membrane of the upper jaw, producing externally an appearance somewhat similar, at first sight, to distension of the antrum. An incision into the cyst allowed the escape of nearly an ounce of turbid brownish fluid, containing crystals of cholesterine.

Cysts connected with defective development of teeth, ‘dentigerous cysts,’ usually confined to the alveolar regions of the maxillæ, are not uncommon. Their history and treatment are related by Mr. Salter, and will be found in the preceding essay.

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* The preparation is in St. George's Hospital Museum.

Obstructions of mucous follicles occasionally give rise to the formation of mucous cysts, already spoken of; the obstruction of the submaxillary or sublingual ducts may be productive of the cysts termed 'ranulæ.'

Again, congenital sebaceous cysts are occasionally found among the tissues of the floor of the mouth.

A young woman was admitted into St. George's Hospital, under Mr. Hewett's care, with a considerable swelling on the right side of her mouth and neck. The swelling bulged into the mouth; had displaced the tongue to the opposite side; and protruded downwards in the submaxillary region. The swelling was painless, but inconvenient from its size; it had been many years forming, and it was doubtful whether it was congenital or not. A free incision through the portion projecting into the mouth, allowed the escape of a large quantity of a thickish yellow fluid, most offensive and putrid in smell, similar to the contents of a suppurating sebaceous cyst. By degrees the cavity contracted and closed.

This patient returned to the hospital about three years afterwards. The cyst had again filled, and projected a good deal below the lower jaw. It was now opened by the author, in the neck, through the skin, below the lower maxillary bone; and a large quantity of offensive sebaceus-looking fluid was evacuated; a seton was then passed through the cyst, and retained several days, until the cavity had become perfectly contracted. The opening soon closed, and as far as could be ascertained, the cyst appeared to have been obliterated. The patient has not again shown herself; but promised to do so on the slightest recurrence of the swelling.

The diagnosis of cysts of the mouth is not often complicated: usually, fluctuation is very evident; as frequently, the surface of a portion of the cyst projects into and on one side of the mouth, so that it may be seen covered only by mucous membrane; the walls are thin and pellucid; the contents visibly transparent, or slightly tinged from some accidental circumstance or individual peculiarity.

In other cases these cysts present more obscure conditions: they may lie deep among the muscles of the floor; or may press backwards and interfere with the movements of the larynx or pharynx; or a sanguineous tumour may be mistaken for a cyst, though sanguineous tumours are exceedingly rare in these parts.

Such serous and mucous cysts as we have referred to, may be treated without hesitation, and without much danger. If very large, it may be as well to draw off a portion of the fluid, in the first instance; and subsequently have recourse to setons, or injections of iodine. But as in any operation in the region of the mouth and neck, œdema may occur about the root of the tongue and the fauces, and interfere with deglutition or respiration, it is better to select the less irritating and most simple treatment, before proceeding to the more heroic.

In the treatment of *mucous* cysts of the mouth, a seton, or injection of iodine, will often be found inefficient; the cyst may fill again in a short time. If a portion of the cyst be cut away, the contents allowed to escape, and nitric acid applied freely to the interior, the treatment will generally be found successful. Some of the small, isolated, mucous cysts, situated immediately under the mucous membrane, may be readily removed by the knife; but the attempt to remove a large and more deeply-seated cyst is hazardous and unnecessary. Sir W. Fergusson relates a case which illustrates the difficulties a surgeon may encounter in such a proceeding, and the danger the patient may undergo.*

We would strongly dissuade the attempt to remove a large cyst in the region of the mouth; not only are there considerable obstacles to the entire removal of the cyst from its bed, but the operation must necessarily be a tedious one, and there would be risk of great loss of blood. By laying the cyst freely open, in all probability it will close up from the bottom, or, at any rate, become so much diminished, that ultimately a series of punctures or openings, a seton, or injection of iodine, will effect its obliteration. A silver wire may be used as a seton, if the cyst project more towards the integuments than the mouth, and the contents, by tapping, are proved to be clear and thin; but if opaque, dark-coloured, thick, or purulent, a free incision is the safest, the most effectual, and the least tedious treatment to adopt.

A large cyst opened by incision in the mouth, and found to contain purulent fluid, may not contract very rapidly, in consequence of matter bagging downwards in the neck, in the lower part of the sac. Under such circumstances, a small opening may be made under the jaw. But as a scar in the neck, especially in women, is always objectionable, such an opening had better be avoided unless absolutely requisite.

By far the greater number of the different varieties of cystic formations (independent of bone) will be found on the inner surface of the lips, the surface of the gums, or on the floor of the mouth; and the treatment above described may be followed accordingly, care being taken to ascertain first the character of the fluid contained; for should the contents be blood, the treatment should be different to that described.

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* Fergusson's *Practical Surgery*, p. 599.

Sanguineous cysts about the mouth are rare. When present, they are usually seen on the lips, near their free border. Instead of free incision, when deeper seated they should be treated with setons or ligatures; when superficial and accessible, they may be dissected out, or included in a ligature, like a nævus.

To sum up the evidence on the history of mucous or serous cystic affections of the mouth, we find that, in early life, they occur either singly or in clusters; are generally of a congenital nature; and are found most commonly on the floor of the mouth, or, in after life, on the surface of the gums. Venous or sanguineous cysts are generally observed in the lips and on their inner surface; are usually congenital, and frequently stationary; in this they differ from other cysts. Sebaceous cysts, containing sometimes a mixture of epithelial, thick, white, and often putrid matter; hair growing from the lining membrane (which partakes of the character of cuticle); or loose hairs; bone or teeth—these have no peculiar affection for locality, are most capricious in their selection of spots for habitation, and may be found in any part of the mouth or its immediate neighbourhood. They are usually round, small, and, if immediately under the mucous membrane, appear like a white marble embedded in the areolar tissue. Their inclination is to grow slowly; so slowly in some instances, that years may elapse before their presence occasions inconvenience. These may all be of the congenital variety. Mucous cysts, ranulæ, cysts of the lips connected with portions of solid or glandular growth, some serous cysts, and those generally single, will be found to commence after birth, and at different ages. They usually occur before very advanced life.

Solid growths of the lips and mouth, of a non-malignant, *i.e.* non-cancerous character, are not of many kinds, nor do they frequently occur. Labial glandular tumours have already been referred to. Occasionally a fatty tumour grows among the muscles of the tongue, or about the floor of the mouth. The diagnosis is usually simple, though when deep-seated it may puzzle the surgeon, until he cuts down upon the growth. Its tendency is generally to protrude towards the skin, rather than towards the mouth; the constant movements of the tongue being usually sufficient to direct the mass towards the least resistant surface.

A fatty tumour need only be removed when of an inconvenient size. A free incision over its surface, below the jaw, will generally allow of its being readily dissected or dragged out.

The author removed one for a lady, forty years of age, who had been aware for some years of its existence, under the tongue and jaw, on the left side. On cutting freely down upon it, the lobes of fat were found to dip deeply into the floor of the mouth, round the mylo-hyoid muscle; but the whole was readily removed.

The chief danger attendant on such an operation is extension of inflammation and suppuration to the intermuscular tissue about the root of the neck. The lady alluded to, had for some days considerable pain and difficulty in swallowing, but ultimately recovered.

A solid mass is sometimes observed in the floor of the mouth, of a calcareous consistence. Such a mass is often contained in one of the salivary ducts; it is but a salivary calculus. Occasionally, from neglect or indifference, one has been known to acquire a size which would be usually considered an intolerable nuisance and a source of constant disturbance to the patient's comfort. It can be readily removed by a slight incision over it through the mucous membrane.

The condition, in infants, known as 'tongue-tie' has been spoken of in the essay on Diseases of the TONGUE.

TUMOURS OF THE JAWS, AND THE OPERATIONS FOR THEIR REMOVAL.

There are few points in Surgery which require more careful consideration, in order to arrive at a correct diagnosis, than the variety of tumours which affect the upper and lower maxillary bones. We propose to consider these tumours in the following order, viz.:

1. Cartilaginous.
2. Cystic.
3. Fibrous.
4. Myeloid.
5. Osseus.
6. Vascular.
7. Mucous, or Myxoma.
8. Cancerous.

The operations for the removal of tumours of the jaw will form the subject of subsequent consideration.

Cartilaginous tumours of the bones of the face are rare, and the upper and lower maxillæ may be said to be almost free from their attacks.

Mr. Paget alludes to but one well-known case, which occurred in the upper jaw of a patient in Guy's Hospital. Mr. Beaumont, Professor of Surgery in the University of Toronto, has recorded an interesting case in the *Royal Med. and Chir. Transactions,*[*] which occurred in a boy seven years of age, affected the lower jaw, and was successfully removed.

In the Museum of the College of Surgeons is a wonderful specimen of one of these tumours, which implicates the greater portion of the lower jaw; it had been some eight years growing, and when the patient died, exhausted by its ravages, it measured two feet in circumference.[†]

The symptoms and prognosis of enchondroma are the same, when it affects either of the jaw-bones, as in other parts of the body. These tumours of the jaws may be removed with much confidence of relief. The operation cannot be too early decided on; delay may be so far dangerous, that a very rapid growth, by a short postponement, may really make the operation very severe and extremely hazardous.

In the removal of the smallest cartilaginous tumour, care should be taken that every particle of the surface of the bone from which it is growing be freely removed. In the removal of the larger tumours, it will depend on the involvement of the bone, how much of it has to be removed. The greater portion of one side, or even the whole, of the lower jaw, or the whole of the upper maxillary bone, if involved, must necessarily be taken away. The disease will probably be restricted to one side in the upper jaw; in the lower, it may more readily involve the greater part of the bone. The prognosis after operation is usually favourable; but it should not be overlooked that enchondroma sometimes recurs, and that in other cases the tumour grows rapidly, and large cysts are developed in its substance. Both these forms of enchondroma approach in character to cancerous tumours.

Cystic tumours of the jaws are not very uncommon.[‡] We undertake their consideration in this place, in order to mark particularly the distinction which must always, pathologically, be made between the secondary cysts of bone resulting from degeneration of cartilaginous tumours, and the primary cystic tumours which attack the upper and lower maxillæ. The latter are seen to originate in the substance or from the surfaces of the jaw, under a variety of unexplained circumstances.

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[*] Vol. xxxiii. p. 243.

[†] Museum Catalogue, No. 1034.

[‡] See Stanley, *Diseases of the Bones*, p. 268; also, DISEASES OF BONES, Vol. III. p. 827.

Cysts of the jaws are sometimes found to be connected with a diseased condition of a tooth-fang; or, more frequently, with a diseased action attendant on the development of the tooth-pulp—'dentigerous cysts.' (See p. 363.)

Specimens of simple primary cysts of the jaws, commencing in the substance of the bone, may be found in some of the museums of the metropolis. They expand the bone more or less, so as to take with them portions for their outer covering or walls, the remainder of which will be generally made up of a tough membranous substance. The contents are fluid, serous, or gelatinous, and of different shades of colour. 'This disease is usually of slow growth; and there have been instances in which the tumour of the jaw, formed by it, has acquired a large size.'*

In the Museum of St. George's Hospital may be seen a preparation (Fig. 251) which well illustrates the prominent features of a simple cystic tumour of the jaw. The tumour was removed from a woman forty-five years of age. It occupied on the right side the situation of the lower jaw, and extended from the second incisor to the condyle of the bone: it formed a large globular cyst, which occupied nearly the whole of the side of the face. It extended downwards over the upper portion of the neck; and inwards, displacing the tongue; it greatly interfered with speech and mastication. The principal part of the growth was upwards and outwards towards the malar bone, which was somewhat expanded and partly absorbed. In some parts the tumour appeared of bony hardness; in others very elastic. The integument covering it was not discoloured, and there was no enlargement of the neighbouring glands. The disease had been noticed about eighteen years before admission, when it formed a small hard incompressible lump, just over the angle of the jaw: it gave no pain; and for a long time its increase was extremely slow. About six months previous to her admission, it commenced to enlarge very rapidly. The cyst may be seen in the figure to extend from the symphysis to the right condyle.

The parietes are partly osseous and partly membranous. The entire substance of the jawbone on this side has disappeared, and is replaced by the foreign growth. When removed, the cyst appeared to be divided into several cells, which contained a transparent gelatinous fluid; though in the dried preparation there are but few indications of such divisions. The tumour was successfully removed; but the patient died subsequently from erysipelas.

In the Museum of the College of Surgeons there is a specimen of a cyst of the lower jaw, occupying the greater extent of the right side, and projecting outwards rather than upwards. It is oval in shape, and multilocular; the cells were filled with a glairy fluid. The diseased portion of the jaw was successfully removed.*

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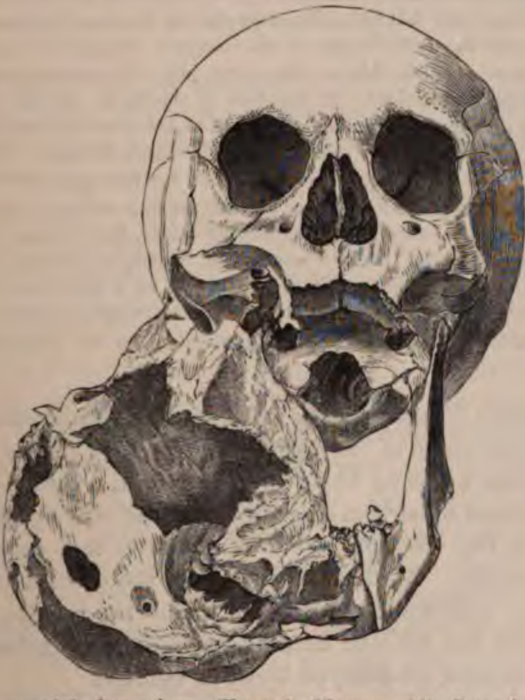
* Stanley, op. cit. p. 207.

Whatever the origin of these cysts, they appear, on the one hand, independent of any tooth-irritation; and on the other, of any previous cartilaginous deposit. The diagnosis in such cases is not beset with much difficulty; and even if a doubt exist as to the nature of the tumour, it is at all times safe and easy to explore it with a fine trocar.†

FIG. 251.



Cystic tumour of the lower jaw. (From the Museum of St. George's Hospital.)

In the treatment of these tumours, it is a milder and a more justifiable course to make a free incision into the cyst, and subsequently to trust to reparative action, than at once to have recourse to removal of the diseased mass.

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* Museum Catalogue, No. 1033.

† M. Giraldès has described a form of cyst in connection with the upper jaw, which he believes to be of very common occurrence, and to be formed by a morbid change in mucous glands naturally existing in the lining membrane of the antrum of Highmore (see his *Recherches sur les Kystes muqueux du Sinus maxillaire*); but no such origin can be ascribed to those which distend the body of the lower jawbone in the manner above described.

If the cyst be large, or even if it be ultimately requisite to remove it in its entirety, the previous incision will in all probability have much reduced it in size; when the parts, if not in a better, will certainly be in no worse condition for removal.

In both the cases related removal of the tumours was accomplished without difficulty. Two cases are mentioned by Mr. Paget, in which incisions were employed successfully; but in neither case did the bone appear diseased.

In a case under the author's care in St. George's Hospital, the cyst occupied a large portion of the left side of the upper jaw. Its anterior wall projected under the cheek, and bulged out the side of the face. A free incision was made into the cyst from within the cheek. The anterior wall was found to be partly membranous, and partly consisted of thin flakes of bone. A portion was readily removed, so that a free opening was left for the escape of the contents, which were of a glutinous consistence and brownish in colour. At the bottom of the cyst there was found projecting into its cavity, the extreme point of the fang of the canine tooth. On the removal of the tooth, the fang was found to be partially necrosed. The cyst filled and closed in a short time without any further treatment. The patient was about ten years of age, and when he quitted the hospital there was no trace of the disease left, nor the slightest disfigurement.

In all cystic diseases of the jaws, careful examination should be made of the teeth of the corresponding jaw; all diseased ones near the growth should be at once removed. One of the most frequent causes of serious mischief, and still oftener of exquisite suffering, is the too long abode of defective and decayed teeth in their sockets. We feel satisfied that the greater the experience in the treatment of diseases about the mouth, the more exacting will the surgeon become respecting the removal of all useless, defective, or decayed teeth or stumps.

Fibrous tumours of the upper and lower jaw are by no means uncommon; and in their general features, in their growth, and in their varieties, correspond to fibrous tumours of other parts. 'The favourite seats of fibrous tumours of bone and periosteum are about the jaws.'* Such tumours may originate in the substance of the bone, and in growing, expand it, as a crust, over the outer surface of the tumour. In the Museum of the College of Surgeons there is a preparation showing a fibrous tumour of the jaw, with a thin shell of bone over it.† They may grow from the periosteum, and embed the bone in their surrounding mass. They affect equally the upper and the lower maxilla. They may appear early in life.

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* Paget, vol. ii. p. 145.

† No. 1045.

Mr. Liston removed a large fibrous tumour of the upper jaw, in a woman twenty-one years of age, which had made its appearance four years previously.* It grew on the outer side of the jaw, and was removed six months after its first appearance, when about the size of the end of the thumb. In eighteen months, a return of the disease, the size of a hen's egg, was removed, with a portion of alveolus. The growth reappeared in two or three weeks, and attained a large size in two years, which rendered necessary the removal of the whole of the superior maxillary bone. The patient recovered.

Fibrous tumours of the jaws are usually of rather slow growth; but their growth may in exceptional cases be somewhat rapid. Their usual history is one of progressive and persistent increase; perhaps more rapid in proportion to their increase of size, but, in the main, rather slow than rapid. The size some will attain is best illustrated by the collections in our various museums; and especially the preparations collected by the late Mr. Liston, now in the possession of the College of Surgeons. In some respects, as to the size which they attain, they appear to vary from fibrous tumours of other parts, and especially those of the uterus; for fibrous tumours of the jaws are not usually seen to expend their energies in growth; they are not seen to stay their course, to degenerate, or calcify; or perhaps something may be said to depend on their position, for this is such that it can never permit of sufficient increase, or life, to attain that end, without first having grown to such a size as would occasion a fatal impediment to deglutition or respiration. They are usually painless in their growth, and innocent in character, as compared with cancer; but their locality, as they grow, renders them formidable as to disfigurement, as to discomfort, and even ultimately to life, if they be not removed before such growth be attained. It is wise, therefore, to pass the verdict of early removal, when we have to pronounce judgment on such cases; the earlier the operation is performed, the less formidable will it be. We cannot hold out a prospect of arrest; but we may certainly forewarn as to the inconvenience of delay, and we may positively predict danger from increase.

In their structure, we cannot point out any distinction between the fibrous tumours which attack the lower, and those found connected with the upper jaw; but, practically, there are some important considerations connected with the history of the latter, to which we would especially draw attention; and a knowledge of which is most essential to any operator dealing with such cases. Fibrous tumours of the lower jaw are invariably more or less globular in form; usually they have a uniformly smooth surface; their tendency is to protrude externally, more tha towards the mouth: if originating in the substance of the bon perhaps they may be found equally surrounding it; if origina ing in the periosteum, perhaps most prominent on the corr sponding surface. Fibrous tumours of the upper jaw are ofte far different in their outward character, in their surroundin relations, and in the tendency they display, from position, spread in different directions. A fibrous tumour supposed to attached to the upper jaw, may really have its origin from t base of the skull, the sphenoid, or the ethmoid bone; and fro either point make its way through the various foramina a fissures, and into the various fossæ in and around the superi maxilla. Instead of a globular dense mass, as in the lower, t tumour of the upper jaw may be lobulated; or, from its ve position, and as a result of its insinuation into these fissure and fossæ, it may be moulded, as it were, into a mass of pedun culated bodies, somewhat analogous to the bulbous roots of tuberous plant; or commencing in the interior of the antru it may by growth or position be pressed through its anterio wall, and puff out the cheek; or through its floor, and pus down into the mouth; or into the nares, and plug up th lachrymal duct; or into the orbit, and displace the eyeball; o into all or several of these spaces, and produce correspondin eformity. So that the diagnosis of the origin of a fibrou tumour of the upper jaw is often as complicated an affair as tha f the lower is easy; indeed in some cases, until the upper ja e removed, it will be impossible to determine to which portio f the skull, or bones of the face, the growth may be attached.

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* Museum of College of Surgeons, No. 1046.

The following case illustrates the force of these observations. A man twenty-ive years of age was admitted into St. George's Hospital, under the care o r. Prescott Hewett, 'with a large tumour, of an irregular shape, occupying arious regions of the left side of the face.' In the cheek, it formed a swelling f the size of a turkey's egg, and filled up the greater part of the superior axillary region; the outline of the bone was perceptible to the touch in ew places only; the zygomatic arch was much more prominent and more curved han natural, having been pushed forward by the tumour, portions of whic ould be felt under the temporal muscle. The diseased structure was also found n the shape of small flattened bodies, at the lower part of the orbit, lying imnediately underneath the conjunctiva, and apparently quite movable; the bones f the inner and outer walls of this cavity, as well as those forming its circumerence, were not affected or displaced; but it was impossible exactly to make ut the state of the bones at the lower wall, owing to the tumours which were there; the eyeball was not more prominent than natural. Portions of the morbid growth were detected in the left nasal fossa, from whence a small round mass projected slightly, at times, into the pharynx. The tumour overlapped the front part of the alveolar process, and projected beneath the lip.

About six years previous, the patient had observed, what was supposed to be a polypus of the nose, which was easily removed; but some little time after, the cheek began to swell, and gradually the tumour commenced to show itself in the various other positions described. Its growth was painless throughout. A year previous, caustic had been freely applied, with the idea of destroying it; and two large cicatrices marked the places of its action. At various times, there had been extensive bleeding from the nose; these bleedings had somewhat reduced the patient, who was of a spare habit and pale; this paleness being attributed to a loss of blood, which occurred shortly before his admission. It was decided to remove the tumour by the usual incisions for the removal of the upper jaw. The bones having been divided with cutting forceps, the superior maxillary and malar were easily tilted out of their place; when it was found that the disease was not connected with the upper jaw, but was behind it. The greater portion, which was in view, was removed; some portions were lying in contact with the pterygoid process; some portions embedded under the temporal muscle; other portions in the orbit. Before the operation could be completed, the patient became so faint, that it was found impossible to proceed with the operation, and he subsequently sank.*

The preparation of the parts shows the superior maxillary and malar bones, and portions of the tumours extracted from behind them; the bones are healthy, but altered in shape from pressure; the tumours present all the characteristics of fibrous structure. The parts removed after death show a morbid growth, originating in the root of the left nostril, and especially on the inner edge of the pterygoid process and under surface of the body of the sphenoid bone, to which parts small portions of tumour were found still attached. The sphenoidal sinuses were filled with diseased structure of a similar character, and were very much dilated; so much so, that at one point the bone had altogether disappeared and left a small hole, where the tumour was lying in contact with the dura mater. A small portion of the growth was also found at the upper and back part of the septum nasi, which was forced over to the right side and partially destroyed by absorption: here the mucous membrane was somewhat thickened; and there was a small pendulous body, loosely connected to the velum palati, and hanging by the side of the uvula. Small flattened growths of a similar nature, and of a bulbous shape, were found deeply embedded in the spheno-maxillary and temporal fossæ, as well as at the back part of the orbit. None of them had any attachment to the bones; they were all connected to each other, and to the growths in the nostril by a slender pedicle, which passed in the direction of the spheno-palatine foramen; the growth in the orbit had reached that situation by creeping through the spheno-maxillary fissure. The bones of the orbit were quite healthy. The preparation is in the Museum of St. George's Hospital.

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* *Med.-Chir. Trans.* vol. xxxiv. p. 43.

The removal of a fibrous tumour with the entire portion of the jaw with which the growth is connected, does not necessarily insure an immunity from recurrence. Two specimens in the Museum of the College of Surgeons illustrate the reproduction of a fibrous growth, subsequent to the removal of a previous one.

One preparation shows the right side of the lower jaw, from the angle to the first bicuspid tooth, with a tumour of a fibrous character, two inches in its greater diameter, and situated entirely on the anterior surface of the bone, and extending along nearly the whole portion removed. Its base is osseous, and the rest fibrous.* The other shows the ascending ramus, condyle, and coronoid process of the lower jaw, with a tumour of a similar character.† A woman thirty years old had suffered from 'toothache' from nine years of age, after a blow on the cheek. The first portion of the jaw, with the tumour, was removed about five months after it was first observed; its growth had been painful, both in the jaw and the cheek, and was attended by constant headache. No portion of the disease was apparently left at the first operation. But the disease reappeared at the ramus, which was subsequently removed at the joint. The patient recovered.

Subject to this occasional tendency to recurrence, fibrous tumours may be classed as essentially innocent; largely so, in proportion to many of those which affect the jaws; if by the term innocent we intend to convey the possibility of complete eradication by operation, and, subsequent thereto, a total immunity of the part and the system from recurrence of the disease.

And yet, as in other parts, so in these, we must be prepared to meet with fibroid tumours which present many of the characteristics of true fibrous growths, but possess in addition the peculiar property, that upon each removal there appears a more rapid tendency towards recurrence, as well as greater rapidity in growth: from the true structure of fibrous tissue, as each removal takes place, there is a gradual shading off into fibro-plastic or mere gelatinous tissue; until at last rapid growth and rapid deterioration of constitution run hand in hand, and the patient sinks, exhausted by a foul ulcerating sore based on a monstrous fungoid mass. When cut into, this mass presents a smooth, gelatinous, and somewhat elastic surface; the structure abounding in serosity, and often readily broken down; void of many blood-vessels, and of a low vitality.

Fibrous tumours of the jaw may be partly composed of bone; or partake of a fibro-cellular character, such as we find in similar tumours of other parts of the body. In the Museum of St.

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* No. 1041, College Museum. † No. 1042, ibid.

George's Hospital is a preparation showing, on section, a small nucleus of bone which in no part approaches the surface of the tumour.* Another specimen shows much bone radiating into the substance of a fibrous tumour from its base, and approaching in some parts very near the surface.

Fibrous tumours, usually of slow and painless growth, are often attended by suffering when they affect the jaws; and their growth may be sufficiently rapid to require the aid of the surgeon within a few months of their outset, to obviate the serious results of pressure and encroachment on the cavity of the mouth.

'As a general rule,' says Mr. Paget, 'the vascularity of a fibrous tumour is in inverse proportion to its singleness and toughness of construction.' † Yet, in the region of the mouth, we constantly observe a tendency to recurring hæmorrhage; perhaps to be attributed in some measure to the friction the surfaces may be subject to, or the accidental bruising they may receive, in the daily process of mastication. This hæmorrhage is not usually very great at any one time; but it has this important practical bearing, that by its amount or by its frequency it deprives the patient of much blood; he becomes blanched and reduced; and if relief be long deferred, he becomes little capable of undergoing an operation, which of itself often exacts the immediate loss of a large amount of blood. A case already related points to the principle here enunciated.

Myeloid tumours of the jaws.—What has already been said relative to the general features of fibrous tumours originating in the jaws will to some extent apply to myeloid tumours affecting these bones. They will perhaps be found to affect those parts almost as frequently as the fibrous tumours. The Museum of St. George's Hospital contains several specimens of myeloid growths, connected with the maxillary bones.

The general characteristics of these growths have been well summed up by Mr. Paget. 'Myeloid tumours,' he says, 'usually occur singly; they are most frequent in youth, and very rare after middle-age; they generally grow slowly, and without pain; and generally commence without any known cause, such as injury or hereditary disposition. They rarely, except in portions, become osseous; they have no proneness to ulcerate or protrude; they seem to bear even considerable injury without becoming exuberant; they may (but very rarely) shrink, or cease to grow.'*

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* Series ii. No. 155.

† Op. cit. vol. ii. p. 134.

A specimen in the Museum of St. George's Hospital shows a tumour about the size of a nut, with a portion of the whole depth of the lower jaw, which was removed from a girl eight years of age. Four and a half years after, she remained well.† Mr. Cæsar Hawkins removed a tumour of a similar nature, with a portion of the alveolus of the upper jaw, from a little girl five years of age, in St. George's Hospital. This had grown rapidly in the course of about three weeks, and was successfully removed.

The diagnosis of a myeloid tumour is always uncertain without microscopical examination of its structure. The general disposition has already been fully described by Mr. Paget. In its origin and growth, in connection with the jaws, it may be mistaken, as in all other parts which it attacks, for cartilaginous or fibro-cellular growths. Its characteristic features are most marked in its intimate structure; for an account of which we refer the reader to the essay on TUMOURS, Vol. I. p. 535.

The nature of myeloid tumours of the jaw permits of no half measures in treatment; entire removal of the growth, with the portion of bone to which it may be attached, is the only safe, the only justifiable course to be pursued; and no delay should be recommended or sanctioned. As it will surely grow large when once started, it should without hesitation be removed whenever detected. The removal does not always insure safety. There is no doubt that myeloid disease is sometimes recurrent. The experience of late years has fully established this fact.

Osseous tumours of the upper and lower maxillæ are not very commonly met with, but occur sufficiently often to make them especially interesting, in connection with the surgery of the mouth. They will be found to occur in two different forms or characters: simply as outgrowths from the parent bone, to which a base more or less narrow or broad is attached; or as a general thickening and enlargement of a part, or of the entire bone, terminating often in considerable and even frightful malformation.

The true osseous tumour is often compact, heavy, hard, and ivory-like on section; or else more spongy or cancellous, much ss hard, and much less weighty in proportion to its size. ractically, the size, the rapidity of growth, and the locality, re of more importance than the exact condition of its struc- ure.

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* Op. cit. vol. ii. p. 217.

† Series ii. No. 168.

Osseous tumours are seldom rapid in growth; they may ffect any portion of the jaws; they are not usually painful, but enerally and steadily increase in size, and sooner or later their moval is rendered imperative.

In the Museum of the College of Surgeons is a preparation hich shows the true character of the hard ivory-like tumour the jaws. It is seen growing from the angle of the lower w, to which it has an attachment by a broadish base.* nother similar specimen may be seen in the Museum of t. George's Hospital.† The removal of these out-growths, hether they implicate the upper or lower jaws, presents no reater difficulties than does the removal of fibrous or other mours; excepting, that if deeply nodulated and irregular on he surface, they may be entangled in the fibres of the ad- cent muscles, and require much careful, it may be tedious, issection, before they can be cleared from the surrounding soft arts.

There remains to be considered the other condition referred to, in which the bones of the face, or any portion of them, take on a peculiar process of growth, thickening, and occasionally great enlargement.

The Museum of the College of Surgeons contains specimens illustrative of this diseased action in bone, and they demonstrate what an amount of hideous deformity may occur in the victims of this horrible disease—horrible, inasmuch as it appears perfectly beyond the control of medical treatment; and unless seated in a part readily removable, entails on the wretched sufferer a lingering malady which, though slowly, yet surely, in most cases, continues its growth until its mechanical interference with the process of deglutition, or some other complication, auses death.

The tendency of this disease appears to be, that it does not estrict itself to one bone, or one portion of a bone; but that veral bones contiguous to each other may become affected in eir turn, and to such an extent that all surgical interference ould be quite out of the question. If, however, the disease be confined to one portion of the face, such as the lower jaw or the antrum, it may probably be relieved by operation.

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* No. 1035.

† Series ii. No. 191.

This diseased action may be set up in very early life. A case is related by Mr. Paget, in which Mr. Stanley removed the superior maxillary bone in a girl, fifteen years of age, in whom the swelling had been observed to commence eight years previously.

With respect to treatment of osseous tumours generally, it will be found, as a rule, that neither local applications nor constitutional measures appear to arrest, or destroy their growth. It is but a waste of time, and trifling with the patient's confidence, to suggest anything but the entire removal of the tumour. Of course this recommendation will depend on the amount of bone implicated by the disease; but if the mass can be *entirely removed* by the knife and saw, and the operation be otherwise practicable, the removal of the tumour is most likely to be perfectly satisfactory in its results. 'It may be stated,' says Mr. Stanley, 'that absolute security against the reproduction of an exostosis, can be obtained only by the removal of every part of its circumference. If but the smallest portion of the exterior of the exostosis, with its cartilaginous capsule, be left, reproduction of the tumour will be, at the least, not an improbable occurrence.' *

Experience has fully confirmed the observations just quoted; and the caution which they inculcate is, not to attempt the removal of a portion, when the whole mass of an osseous tumour may present obstacles to its entire resection. How far the hypertrophied condition of bone may hereafter prove to be subject to constitutional treatment, is a fair question of experiment. The disease is not common, and opportunities are few in which the efficiency or benefit of drugs, externally or internally, can be fairly tested. The disease has certainly something more of a constitutional character than simple osseous outgrowth, and the condition is one which has been known occasionally to assert the prerogative of hereditary transmission. In reference to treatment, Mr. Stanley states, that 'medicines have no influence upon the disease.'

In their removal by operation, there is an exception to the rule which applies to osseous tumours, that the whole of the disease must be removed; for when the deformity is the result of hypertrophy, if the whole mass is beyond removal by the surgeon, even a portion may be cut away with present if not permanent benefit. 'I know, in cases where only part of the hypertrophied bones have been removed, the wound has healed soundly over the remaining portion of them; and it has not in such instances appeared that the operation was followed by any increase of the disease.'*

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* Stanley, *On Diseases of Bones*, p. 157.

Vascular tumours of bone are so rare, and of the jaw so few instances have been put on record, that we even venture to express some hesitation in taking for granted that those described may not have been tumours of a cancerous nature. The entire removal of the disease is the only treatment to be recommended. As described, the disease appears to commence in early life, and to be painless; but its external characters are such that no very accurate opinion can be formed of its nature, unless it present on the surface the deep-red colour produced by enlarged vessels.

Mucous tumour, or myxoma.—Virchow has drawn attention to this variety, and Mr. Moore fully described its characteristics in his article on TUMOURS (Vol. I. page 525). They are rare in the jaw, but have been met with. They may be removed like other tumours, and are not liable to return.

Cancerous tumours of the maxillæ, and cancerous ulcerations of the gums, remain to be considered.

Cancer of the bones of the mouth is by no means uncommon; it is generally of the medullary form, occasionally of the osteoid variety. Cancer of the gums is more rigidly confined to the epithelial character. Scirrhus, in its onslaughts, appears to disregard these regions; for though found as a secondary condition in bone, it has not fallen to our lot to notice it in the bones of the face; the experience of others confirms this observation.

Cancerous growths are observed more frequently to affect the superior than the inferior maxilla, and to commence most frequently in, or around, the walls of the antrum. The history during life, and the anatomy, of medullary and osteoid cancers of bone, written elsewhere in this work, apply in every minute particular to the origin, the growth, and the structure of cancers affecting the bones of the face. It is not, therefore, requisite to enter now into a minute examination of their constituents; our remarks will embrace the chief practical features to which the attention of the surgeon should be directed, so that a correct diagnosis be arrived at, and prompt measures adopted where necessary.

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* Stanley, *On Diseases of Bones*, p. 5.

Age is no criterion, in the diagnosis to be formed, respecting a cancerous tumour of the mouth. We observe the disease in children, in persons of middle life, in the extreme of old age. It commences often without pain, but it rarely progresses without suffering; and in many instances the pain of cancer affecting these bones is one of unmitigated torture. The external appearances of these tumours differ in many ways, and much in each case.

When the disease is confined to the lower jaw, its character may be more readily and earlier detected than in the upper. If medullary, it displays a softish pulpy mass, more or less elastic; projecting, it may be, on the outer side, and bulging out the chin or cheek; or on the inner side, and pushing down towards the throat; or it may uniformly surround the bone.

A case illustrative of the latter condition was (1863) in St. George's Hospital, under our care. It was rapidly running its course. The patient, a man aged forty-six, observed a swelling on the outer side of the lower jaw four months previous to admission. The tumour rapidly increased, and, on admission, involved the bone, from the symphysis to the first molars on each side. It projected backwards and downwards to the hyoid bone. The skin over it was stretched, and partially adherent, especially at the lower and left side, where it was thin, soft, red, and pulpy; much as if the disease had nearly made its way to the surface. Some of the teeth on the left side were becoming prominent and loose. Under such conditions, it was thought best not to interfere by operation. The patient died about three months after his admission.

Occasionally the masses which project into the mouth run early into ulceration, discharge very offensive matter, and often have a ready tendency to bleed. If teeth become loose and are removed, a fungoid growth shortly fills the vacant alveolar sockets. The external parts, if the tumour project in their direction, appear soon to become thoroughly implicated in the growing mass; the skin becomes bound down to the parts beneath; it becomes darker coloured, dusky-red, or purplish; brawny, uneven, and puckered, with soft round knobs projecting outwards; and ultimately ulcerated, when rapid destruction of structure sometimes occurs from sloughing. A foul excavated and irregular sore is thus produced. The neighbouring lymphatics frequently bear evidence of the constitutional contamination; and the cachexia of cancer is usually well marked.

When the upper jaw is the seat of cancerous growth, there is often, in its early stage, some difficulty in arriving at a correct diagnosis as to the nature of the tumour. It is often but little exposed to view; it may be entirely embedded in an osseous chamber; or compressed and moulded by osseous walls, which, in the commencement, retard or direct the course of its growth. It may project into the nostril, block it up, and, perforating the septum, pass through to the opposite side; it may commence in the anterior wall of the antrum, and project forwards under cover of the cheek; or from the outer wall, and proceed downwards over the alveolus, and upwards into the temporal fossa; or from the interior of the antrum, and make its way uniformly into the nares, into the mouth, into the orbit, outwards, and forwards, and backwards. As it grows, the bones adjacent to it become expanded to some extent; then implicated or absorbed. If it presses forwards, the cheek and upper lip become distended and puffy; the fungoid growth within increases, and protrudes sometimes, at the angle of the mouth; the eyelids become œdematous, and by degrees are closed; or perhaps, prior to this, the eyeball is pushed forwards or outwards; and the cornea, no longer covered by the lids, ulcerates or sloughs, and the contents of the globe escape. Nothing can be more hideous than the advanced condition of a medullary cancer of the upper jaw, presenting often a mass half as large as the head itself; ulcerated or sloughy on its surface; discharging horribly stinking pus, mixed with blood; and persecuting the sufferer with unabating and often agonising pain.

Rapidity of growth is a strong point in the chain of evidence which is to decide the character of such tumours. But we have already observed, that rapid growth is seen occasionally in tumours of a non-malignant character. In medullary tumours, rapid growth is the rule; early attainment of size a marked feature; and the rapidity of growth commensurate with increase of size. The constitutional deterioration also is continuous. The early contamination of the skin with the tumour should surely point out to the surgeon the extreme foolhardiness of attempting to remove a mass of disease, the extent of which it is almost impossible to define; and, consequently, the satisfactory removal of which is rarely practicable, with due regard to the patient's benefit.

To illustrate the various points herein put forward, and to mark especially the difficulty of obtaining a satisfactory insight into the origin of such growths, as well as to indicate the utter hopelessness of attempting to remove many of them by operative interference, we wish to draw particular attention to the following cases: We were consulted by the parents of a child, L. C., aged five, suffering from a tumour, supposed to be connected with the upper maxilla of the left side. The left nostril was filled up and pushed outwards; the soft palate was much pressed downwards, and a portion of the tumour could be seen at its lower edge. Some attempts had previously been made to drag away the mass; but upon each occasion alarming hæmorrhage occurred. As the disease was evidently medullary cancer, increasing rapidly, and there was great uncertainty as to its origin, it was recommended that no operation should be permitted. The child died within two months of our first visit.

The face was greatly disfigured, by considerable protrusion of the left eyeball outwards and forwards, by the expansion of the nostrils, and by the projection of a fungoid mass from the left one.

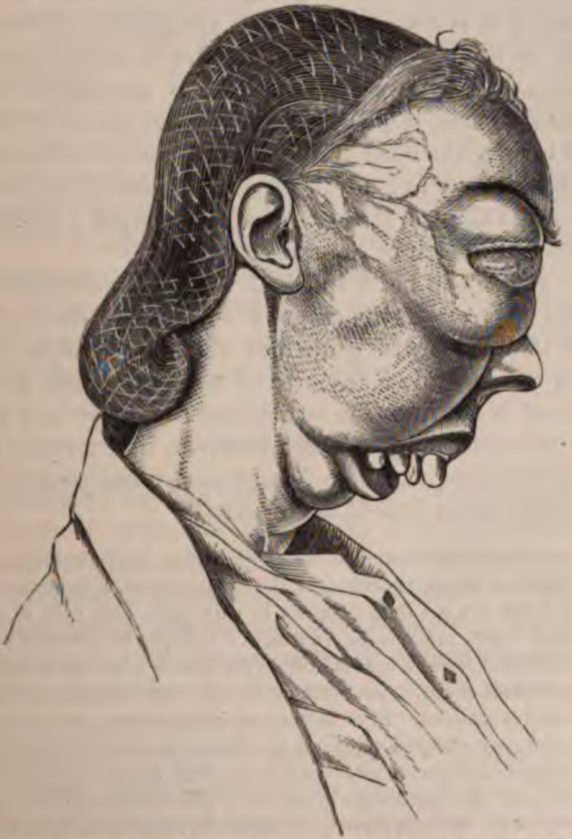
The dura mater, between the sella turcica and the ethmoid bone, was thickened on its attached surface, and readily separated from the bone. The corresponding portion of bone, as well as the cribriform plate and crista, were more vascular, darker coloured, and less compact in structure than natural. The nostrils were filled with a whitish medullary tumour. It had projected in front to such an extent, that it had separated the nasal bones and cartilages some distance from each other. Inferiorly, it had partially protruded through the anterior orifice of the left nostril, and had separated the palate processes of the superior maxillæ and palate-bones, sufficiently to admit the point of a finger between their edges. The septum nasi was absorbed to a great extent; also the inner walls of the orbits; and thus the tumour projected into the cavity of each orbit, occupying the whole of that of the left side, where it had pushed the eyeball outwards, on a level with the anterior orbital margin. The tumour had also penetrated into each antrum. Posteriorly it had passed through the openings of the posterior nares; was in close contact with the under surface of the basilar process, and the anterior surface of the upper cervical vertebræ; pressed down the soft palate considerably; and had extended into the pharynx, almost as low as the epiglottis.

The above case illustrates the progress of medullary cancer of the upper jaw in childhood; the following shows how similar are the conditions in more advanced life; and both show how in each the surgeon would be foiled in any attempt to remove them. A woman aged fifty was admitted into St. George's Hospital in July 1861, under the author's care, for a tumour apparently growing from the antrum, and involving its anterior wall and the hard palate. Five months previous she had a decayed tooth removed from the upper jaw, for pain on the left side of the face and head; immediately after which the gum enlarged, and an abscess which formed was opened, when the escape of about half an ounce of pus took place. The opening closed; but as the swelling returned, it was again lanced two days after; but on this occasion no pus escaped. From that time the swelling continued to increase, and now presented a prominent mass over the antrum and in the mouth, both in front of the alveolus and through the hard palate. The tumour grew very considerably. She suffered excessive pain. The eye, pushed forwards, became opaque, and sight was soon completely destroyed; deglutition also was difficult. She died about ten months from the commencement of the disease.

The skin was not implicated in the growth. The bones surrounding the mass were so soft, that they were readily cut with a scalpel. The tumour projected largely into the mouth; it involved the palate, the inferior turbinated, the ethmoid, the sphenoid, and the superior maxillary bones. Through a portion of the ethmoid and sphenoid bones there was an opening communicating with the cavity of the skull. The growth, with the portion of upper jaw that remained connected with it, is in the Museum of St. George's Hospital.*

H. W., aged thirty-eight, was admitted to St. George's Hospital under the author's care, Jan. 1870. In July 1869, she first noticed swelling of the right lower eyelid, with neuralgic pains over the right temple and brow. After a month the eye began to protrude. In September, the right cheek began to bulge out, and the right side of the nose to enlarge. The sight of the right eye had been

Fig. 252.



Portrait of a patient with malignant tumour of the upper jaw, and deficiency of the lower jaw.

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* The author is indebted to Mr. Charles Hunter for the post-mortem examination.

failing for some two months prior to her admission. The mass now (April 1870) projects into the right nostril, into the right orbit, and outwards under the cheek and masseter; and bulges into the mouth to a slight extent. Hæmorrhage occasionally occurs from the nostril. The increase of the tumour is very perceptible; its aspect is represented by the engraving.

The peculiarity of this patient's condition is, that *she has no vestige of a lower jaw*. It is related by her friends that when two years of age the lower jaw exfoliated entirely; but there is now no indication of such a bone having ever existed. She has always been fed on soft food.*

If a cancerous tumour of the lower jaw be seen in an early condition, if it is situated near the symphysis, and the patient desire it, its removal, with the whole depth of the bone to which it is attached, may be attempted; for if situated in front, the limits may be ascertained, and the tumour dissected out entire. But if it involve the bone near the angle, we can seldom ascertain how deeply it may extend, or to what degree it involves, by infiltration, the tissues at the root of the tongue; it may extend far beyond the reach of the scalpel.

After all, it will be found that much discrimination is required on the part of the surgeon who has to decide upon the removal of a cancerous growth of the jaws: and so much depends on the individual features of each case, that it would be entirely out of the question to attempt a strict code of directions relative to treatment. At best, however, interference by operation is in the large number of cases most unsatisfactory: in the few, we hope some benefit is conferred.

We cannot do greater justice to the subject than by transcribing, in conclusion, the words of Monsieur Giraldès: 'Dans le traitement des tumeurs du sinus maxillaire, il est des cas dans lesquels le chirurgien doit agir, et d'autres cas dans lesquels il est prudent de s'abstenir. Lorsque les tumeurs sont de petit volume, et surtout lorsque la constitution du malade n'est pas altérée, l'art doit intervenir, et dans ce cas, il peut arrêter le mal pendant quelque temps, et prolonger la vie des malades. Si la tumeur est volumineuse, sans que la constitution du malade soit encore altérée; si la cachexie cancereuse n'est pas développée, le chirurgien doit encore intervenir, et par deux raisons: d'abord, parce qu'il peut arrêter pour quelque temps la marche d'une maladie qui a une grande tendance à progresser; ensuite, parce qu'il peut avoir affaire à une tumeur fibro-plastique dont la malignité, dans le cas où elle serait maligne, serait toujours moindre que celle des tumeurs encephaloïdes. Lorsqu'enfin la tumeur du sinus est volumineuse, qu'elle envoie des prolongements en tout sens, que la constitution du malade est altérée, l'intervention de l'art ne ferait que compliquer un état déjà trop grave.'†

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* The patient died soon afterwards.

† *Des Maladies du Sinus maxillaire*, p. 54.

The gums and the other soft tissues of the mouth, if affected by cancer, are usually attacked by the epithelial variety. Commencing gradually on the surface of the gums, it runs its course, similar to that species of cancer elsewhere. By degrees the ulcerated surface spreads; the borders of the ulcer present their usual thickened and elevated edges; not only the cheek, but the floor of the mouth and tongue become secondarily affected. The disease in this situation is generally very painful; much distress is occasioned by movements of the cheek or tongue; much misery entailed by constant escape of saliva; great inconvenience and often difficulty is experienced in articulation and mastication.

No operation in such cases is justifiable. Epithelial cancer affecting the mouth appears to partake of a more malignant aspect than it assumes elsewhere; or rather, we might say, its local position renders it an obstacle to the requisite supply of food: consequently the life of the patient is sooner terminated. The treatment to be adopted is palliative: locally the use of gargles, to obviate the distress occasioned by offensive discharges; constitutionally, anodynes to lull the pangs which constantly dart through the parts affected.

OPERATIONS.

As operations for the removal of the lower or upper jaw, or any portions of them, have been fully described in all treatises on Operative Surgery, we feel that there is nothing new to record in the following observations. Our notice of the diseases of the jaws would, however, be incomplete were we not to lay before the reader the general rules he should observe, and the manner in which he should proceed, when called upon to operate on either of these bones.

Operations in diseases of the lower jaw may involve the removal of but a small portion of the bone; of a large portion of its anterior division; of one half—from the symphysis to the condyle; or rarely of the whole bone, with both articular processes. There is considerable difference in the method of proceeding under these various conditions; but chiefly as regards the external incisions required in each.

A small tumour may occupy only a portion of the anterior part of the lower jaw, and the growth be found connected with the alveolar edge without affecting the bone to a greater depth;

extending perhaps further laterally than downwards. It may have involved the alveolar process to such an extent, that the corresponding teeth are loose or have been pushed out. A case in which a tumour (fibrous) affected the lower jaw to the extent of the four incisors, came under our care a few years ago. The tumour was firm and painless, and involved about half the depth of the jaw. The canine teeth were removed; a saw was then used to cut down on each side of the tumour, through half the depth of the bone; then, with a pair of cutting forceps, the upper half of the bone, between the lateral cuts, was taken away, with the tumour still adherent to it. Sir W. Fergusson relates a case in which he removed a much larger portion, in breadth, of the lower jaw, by a similar operation.* He justly observes, that the advantages of being able to leave the lower half of the bone are very considerable; for the lower jaw retains its shape, and false teeth can be readily adapted to it, when the parts are healed. When, under these circumstances, the tumour is small, no external incision is requisite. In the case alluded to, Sir W. Fergusson was obliged to expose the tumour, by making incisions from the angles of the mouth to the base of the lower jaw. If the operator can possibly avoid cutting through the lip, he should by all means do so: and it will be found that, by drawing the lower lip down, separating it from the bone, and with retractors pulling upon the angles of the mouth, a considerable surface of the anterior part of the bone may be exposed, without any external incision. Instead of two incisions through the lower lip, when a tumour has to be removed with the anterior portion of the jaw, one incision in the median line may suffice: it can be carried down below the chin without any obstacle or objection; and this allows the flaps to be drawn well over to either side, so as to expose a considerable portion of the bone. The downward extension of the incision also affords a ready escape for the future discharge from the wound.

When a tumour involves the whole depth of the bone, and this has to be removed with the morbid growth, the external incisions having been made, the flaps must be cleanly dissected from the tumour, to expose a sufficient surface of healthy bone on each side. In order to enable the surgeon to cut where the tissues are sound, the teeth should be removed where the bone is to be divided. The anterior surface being denuded, the posterior has to be freed from attachments of muscles, &c. Prior to passing the knife behind the bone, the tongue must be secured; a strong ligature should be passed through its apex, and held by an assistant. Of course this is only requisite when the muscles are detached at the symphysis. If this precaution be neglected, the tongue is apt to fall back on the division of its muscles, and the patient runs the risk of suffocation. The ligature may be removed a few hours after the operation; in the mean time it should be held by an assistant, or otherwise secured on the face. A large fibrous tumour of the lower jaw was removed in our presence, with more than half of the bone, without any attention being paid to the tongue; the patient appeared choking, when the tongue was seized with a pair of forceps, drawn forwards, and immediately secured with a needle and thread, and the patient again breathed with comfort. If the tumour be very large, and irregular on its posterior aspect, it is better first to cut through the jaw at its sides, and then subsequently detach it and the tumour from its posterior adhesions. The isolated portion of the jaw can then be turned forwards, and the mass dissected from the soft tissues at the floor of the mouth, commencing within from above downwards. The method of dividing the jaw is simple, if properly performed. The outer shell of the bone should be notched with a fine saw, and then the bone cut through with a pair of strong bone-cutting forceps. When a tumour implicates the side of the lower jaw, or runs near to or involves the ramus, the external incision, to expose the bone, will differ from that described. If it be requisite to disarticulate the bone, the external incision should commence just above and over the corresponding temporo-maxillary joint; be carried down to near the angle; then turned forwards to the side of the chin and (if the tumour extend far forwards) towards the border of the lip, and terminate within a little of its free margin. The integuments of the side of the face included in this line of incision are now to be dissected upwards. The incision has crossed the facial artery; and as the flap is dissected off, the artery must be divided; it had better at once be tied, to save loss of blood. The bone immediately in front of the diseased mass has then to be divided, as described. The portion to be disarticulated must then be seized and drawn outwards; some force may be requisite to effect this. As the bone is drawn outwards, the mucous membrane and muscles are to be detached from its inner surface. The knife has only to be kept in close contact with the bone to effect this, and to avoid all unnecessary danger. As the articulation is approached, the bone should be still pushed forcibly outwards; the point of the knife made to cut close to it, and care taken, in cutting through the ligaments of the articulation, not to let the point be carried inwards, or out of sight. The external carotid or the internal maxillary may readily be wounded, if this precaution be neglected. If disarticulation be not requisite, in consequence of the tumour not extending to the condyle, the external incision need not be carried quite so high on the side of the face; but, in other respects, should be made in the direction just described. The bone, however, will have to be divided behind, as well as in front of the tumour. The remaining stages of the operation are comprised in securing all bleeding vessels and in bringing the edges of the wound together. Silver sutures are probably most useful here. They should be introduced at frequent intervals, so that the corresponding portions of the side of the face be accurately adjusted to each other. The extreme vascularity of the tissues generally secures rapid union, and a speedy recovery from such an apparently frightful wound. The inner surface of the cheek should be supported with a fold of wet lint. The dissevered muscles soon adapt themselves to their novel duty, and within twenty-four hours are capable of supporting the tongue sufficiently to enable it to perform its usual offices, without fear of its retraction towards the pharynx. The chief inconvenience as regards the portion of the jaw which is left is, that it is apt to be drawn inwards. But if a thin cap of metal be adapted previous to the operation, so that the upper and lower teeth can be secured by it, it may be applied, as soon as the operation is completed, with great advantage. It steadies the parts, and does not interfere with the administration of food. This latter should be fluid, and may easily be sucked in between the lips, without separating the teeth on the sound side. The jaw should be supported by a handkerchief or bandage passed under the chin, and fixed over the head. Formidable as this operation is, patients usually convalesce satisfactorily; nor is the disfigurement, subsequent to the removal of a large portion of the lower jaw, or even the whole bone, so great as might be expected. In men the cicatrix can be partially hidden by whisker and beard; and in women a little artificial ornament will readily conceal the greater part.

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* Fergusson's *Practical Surgery*, p. 668.

The material deposited in the situation of the original bone assumes a shape much like that of the jaw itself; becomes firm and fibrous, and able to support a plate with artificial teeth.

If the whole of the lower jaw is to be removed, the incision should extend from one side of the face to the other. Starting from over the articulation, the incision, on arriving at the chin, nstead of being carried up towards the lip, should be carried nwards to the opposite angle of the jaw, and then upwards to he condyle. This is a formidable operation. If practicable, considerable facility may be obtained by dividing the symphysis mmediately after the exposure of the surface of the whole bone. This step will be found to accelerate, and render much less complicated, the separation of the muscles and soft tissues from the inner surface of the bone and tumour, and especially aid in the more rapid disarticulation of each condyle.

The extensive incision necessary for the removal of a large portion of the lower jaw unavoidably passes across and divides the larger branches of the portio dura; the result of which is loss of power over the cheek, and a drawing over of the mouth to the opposite side. This disfigurement, at first, is generally considerable; but appears usually to improve by time, though it rarely entirely disappears. Mr. Syme succeeded in removing a tumour confined to the ramus of the jaw by a modified incision on the side of the face, commencing over the tumour, and continued down towards the angle, and then forwards, without cutting into the mouth. The ramus, with the condyle, was successfully removed.* During operations for removal of tumours connected with the lower jaw, the patient should sit up rather than lie down. The blood thus escapes externally, more readily than into the throat. Chloroform may be given with safety, but requires to be administered cautiously, with sponge or towel held near the nostrils. We should not do justice to British Surgery did we omit to mention that Mr. Anthony White, Surgeon to the Westminster Hospital, was the first to remove a portion of the lower jaw. In 1804, it appears, he set the example, and thus established the practicability of the operation.†

The operations requisite on the upper jaw vary according to the nature of the disease affecting it, an dthe extent to which the walls of the antrum are implicated thereby.

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* Syme's *Contributions to Pathology and Surgery*, p. 21, 1848.

† *Medical Gazette*, 1846, vol. ii. p. 520.

Small tumours growing from and involving the alveolar processes may be usually removed without external incision, as described in the lower jaw. Cysts of the antrum or gums may be attacked with trocar or knife, by first pushing up the lip, or drawing upon the angle of the mouth. But when it becomes necessary to remove a portion of the superior maxilla, the direction and extent of the external incisions are very important. When the tumour is small, and it is supposed to be limited to the inner surface of the antrum, or projects from thence into the nostril, an incision through the middle of the upper lip into the corresponding nostril, continued upwards from the attachment of the ala for an inch or more along the side of the nose, will enable the surgeon to dissect off a considerable flap, and uncover a very large portion of the superior maxillary bone.

When it is supposed requisite to remove the whole of the superior maxilla with a large tumour, a second incision to that described will be requisite. This second incision must be carried through the cheek, from the inner surface of the angle of the mouth, obliquely to the prominence of the malar bone; or if the tumour be very considerable, and implicates the malar bone, the incision can be run outwards over the zygoma; an ample flap may thus be secured, when the soft parts are dissected upwards from the anterior surface of the bones.

If, when the requisite incision is made, and the bone sufficiently exposed, it should appear that the disease is confined to the inner wall of the antrum, or growing from it into the nostril, the nasal bone should be cut through, and turned partially to one side, without entirely separating it from its periosteal attachments. Thus the nostril will be laid fully open, and the tumour can perhaps be removed without cutting away more bone. If this measure be successful, the nasal bone may be replaced, the flap of skin brought over it, and secured with sutures.

If the disease is found to affect the lower half of the antrum, and the orbital plate is free, then the latter may be left, and the former removed. The incisor teeth of the side affected having been extracted, the alveolus in front should be partially divided with a small fine saw; the surgeon cutting from the nares downwards. The cutting-forceps should complete the division of the bone backwards, with that of the hard palate. A line of incision had better first be made along the mucous membrane of the tter, on the side of the median line which is affected by the isease. Then the bone immediately below the margin of e orbit, and from the nostril to the outer edge of the malar ne, must be cut through with saw and bone-forceps, and e attachments of the soft palate separated with the scalpel. he portion of bone to be removed should then be seized with rong forceps, when, by means of a few additional cuts with the ife, the surgeon will be able to dislodge the lower portion of e maxillary bone, with the tumour attached.

If it be requisite to remove the whole of the superior maxilla, e external incision which extends in the direction of the goma must be continued backwards sufficiently to allow of the ee exposure of the zygomatic process of the malar bone. When e flap of the cheek has been freely dissected upwards to the argin of the orbit, the floor of the orbit must be cleared care- lly of the attachment of the inferior oblique muscle, &c. The gomatic process of the malar must be notched with the saw; e alveolar ridge similarly treated; and then the bone-cutting rceps employed. One blade of the instrument should be intro- uced into the nostril, the other at the inner and inferior portion f the orbit; great care being taken that the eyeball is not jured. The blades of the forceps should cut through the ostril and floor of the orbit to the spheno-maxillary fissure; he malar bone should be cut through its middle, right back to he anterior extremity of the same fissure; and the hard palate, n the same side of the septum nasi, should be cut back to the osterior border. Thus the tumour and bone will now only be eld by a few attachments of soft tissue, which the knife easily separates. The bone can then be removed with slightly forcible manipulation, or by twisting it in the grip of a pair of strong forceps.

The hæmorrhage in such an operation is usually greater from the flap than from the rest of the exposed surface; but generally subsides in a short time, so that many ligatures are rarely requisite. The hollow left by the removal of the bone should be partially filled with wet lint, and the edges of the flap secured as already described. In such operations the patient should sit in the upright position, that he may readily get rid of the blood from his mouth. Chloroform should be administered by an experienced person; for its action can only be kept up by its eing applied on a sponge or towel.

Tumours of the upper jaw vary so materially in size, in prominence, and direction, in their point of origin, and in many other circumstances, that, in the direction and extent of the external incisions, much latitude must be given, and much left to the judgment of the surgeon. Langenbeck has described several operations for the removal of tumours of the face. The peculiarity of these operations is, that he has endeavoured to separate the periosteum from the bone (when necessary to remove the latter), and to preserve the former in connection with the soft parts. He believes that he has obtained recovery without deformity by so doing; while, if he had removed the periosteum, deformity would have resulted.

He has also adopted an operation, which he terms osteoplastic resection of the upper jaw. This operation is performed when the origin and growth of the tumour is behind the superior maxillary bone, but cannot be reached without displacing that bone.* Instead of removing the superior maxilla entirely, the requisite external incisions are made down to the bone at once, the bone sawn through in the same incisions, and the portion thus partially detached forcibly turned inwards, without otherwise dividing it from its connections with the nasal and frontal bone. The tumour is then removed from behind the bone, and the latter replaced in its original position. No incision is made at the place where this fracture or bending must necessarily occur.

Langenbeck's observations, and the cases he records, are too lengthy for us to introduce here; we must therefore refer the reader to the original.†

DISEASES OF THE PHARYNX.

Congenital defects of the pharynx are rare, and when they occur are associated with such other conditions of the fœtus as to render them incompatible with life; so that no practical importance attaches to their consideration.

Inflammation of the pharynx is generally a continuation of a similar condition of the fauces and soft palate, but is, though very rarely, seen to exist alone. When complicated with inflammation of the fauces and glottis, the inflammation appears to partake of the erysipelatous and diffuse character, and often terminates in purulent infiltration of the cellular tissue.

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* As in Mr. Hewett's case, referred to on p. 124.

† *Deutsche Klinik*, 1859, No. 48, p. 470; and 1861, No. 20, p 281.

e general conditions indicative of this form of inflamma-
will be considered under the head of œdema of the glottis,
e essay on DISEASES OF THE LARYNX. Difficulty in swal-
g; laboured respiration; swelling of the throat, often ob-
d externally; swollen and rounded uvula and margins of
alate, hiding from view all behind them, are the promi-
symptoms. The tongue soon becomes brown and dry, the
overed with sordes. The patient dies suddenly in a spas-
effort to respire, or gradually sinks. Usually death takes
at an early period, and often sooner than has been
ipated. A patient, well to-day, is attacked in the evening
sore throat and difficulty in swallowing; these symptoms
oon followed by great obstruction to respiration, entire
f sleep, rapid pulse, and hot skin; in the course of three
or four at latest, with all his faculties clear, and while able
ect by motion or writing those around him, the patient's
falls back, and he is dead.

the parts be examined after death, there will be found
a of the sub-mucous areolar tissue, around and in the
ance of the constrictors, and travelling down around the
agus as low as the cardiac extremity. Often the areolar
is the seat of purulent infiltration. The treatment of
cases is most frequently hopeless. As long as the patient
wallow, as long as the mischief stops short of purulent
ation, there is hope of recovery, and encouragement to
vere with the administration of stimulants and nutritious
food, if they can be swallowed; or with enemata of wine,
ae, and beef-tea. Laryngotomy should be performed when
r of suffocation becomes evident, or if the patient is
nly attacked by spasm of the larynx threatening immediate
. Even if the benefit from laryngotomy be not permanent,
rds much immediate relief to the distress of the symptoms,
ertainly prolongs life in most cases.

S., aged forty-five, was admitted on the 29th September 1845, into St.
's Hospital, with difficulty of breathing and swallowing, and all the
ms of diffuse cellular inflammation, extending down the pharynx and
gus. On the 2nd October, at five A.M., he was attacked with a paroxysm
nœa, and became quite black in the face and insensible. Laryngotomy
once performed; and after artificial respiration had been kept up some
onsciousness returned; but it was found that the patient was utterly
to swallow anything, and he died the following day. The effusion of
extended from the cellular tissue round the glottis downwards around

the œsophagus, in the anterior as well as the posterior mediastinum, as low as the diaphragm.[*]

It will be evident to the reader with the above case before him, that when the mischief extends beyond and below the pharynx, and the infiltration is of a purulent character, no possible advantage can be derived from any form of treatment. The patient dies, either in a paroxysm of dyspnœa, or poisoned by the pus locked up in the cellular tissue of the thorax.

Abscess of the pharynx is an occasional occurrence; is generally a formidable evil; and is often as a cause or result, connected with some disease of the cervical vertebræ. Much care must be taken to arrive at a correct diagnosis of such a case; for it may readily be mistaken for a polypoid or other solid growth of the walls or cavity of the pharynx.

The following case well illustrates the importance of this precaution:—An abscess, the size of a pigeon's egg, was situated between the bodies of the upper cervical vertebræ and the back of the pharynx, but from being flattened in front did not cause any material projection of the posterior wall of the pharynx. In connection with the abscess, a second small cyst was prolonged forwards, so as to form a nipple-like swelling in the pharynx; and this compressed and completely closed the orifice of the glottis. The aperture of communication between this process and the body of the abscess admitted the point of the little finger; and the whole swelling was freely movable and perfectly translucent at its extremities and sides. This abscess occurred in an infant seven months old, who had suffered from dyspnœa for three weeks. The difficulty of breathing became very urgent three days before death; was constant, though less urgent at intervals; but the slightest exposure to cold, any motion or excitement, brought on a recurrence of threatened suffocation, attended by a peculiar croupy inspiratory sound. There was no attendant difficulty of swallowing, and no other disease was found after death.[†]

Abscess may arise from an injury to the pharyngeal mucous membrane, caused by the passage or the impaction of a foreign body. In the Museum of St. George's Hospital is a preparation which shows an irregular ulcer, communicating with an abscess, on the posterior wall of the pharynx, which was removed from the body of a young woman who died from its effects, and who had, some six weeks previous to her death, swallowed some pins, one of which was supposed to have lodged in the pharynx, and produced the mischief which so speedily terminated in death.

Ulceration of the mucous membrane of the pharynx is usually the consequence of syphilis; more rarely it is the result of scrofulous influence. In children, the latter condition is sometimes observed to produce considerable destruction of the soft tissues, and its progress is very difficult to control. The symptoms generally are, offensive breath; offensive purulent secretion from the nostrils, and excoriated nasal apertures; constant cough; and the external characteristics of a strumous diathesis. The ulceration is readily seen when the mouth is opened; is not deep, but irregular, and the edges of the ulcer usually well defined; with crusts of dried secretion, often highly offensive, sticking in patches to its surface. There is not much pain complained of; perhaps some, less or more, is experienced when food is taken.

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[*] *Post-mortem and Case Book*, 1845, No. 234.

[†] *Transactions of Path. Society*, vol. i. p. 61.

This characteristic form of ulceration is extremely obstinate in duration, and often extends to the tissues of the soft and hard palate, as well as to the nares. In the case of a little girl in St. George's Hospital, the mischief spread most unrelentingly from the pharynx to the nose and mouth, and from the mucous surface to the deeper tissues; until the nose fell in, and the greater portion of the palate, soft and hard, was destroyed, leaving the child a dreadfully disfigured object.

This strumous form of ulceration is certainly found to exist in children more frequently than in adults. The treatment is to be directed chiefly to constitutional measures, though local applications may also prove beneficial. It should consist of the various tonics, which are beneficial in the management of scrofulous cases generally, aided by good living, great attention to cleanliness and pure air, and, if within the means of the patient, a sea-side residence; the Isle of Thanet is especially to be recommended.

Syphilitic ulceration of the pharynx is very commonly observed, especially in the lower classes of the metropolis. It is constantly seen to attack the posterior wall of the pharynx; but is usually accompanied by ulceration of the velum or tonsils, or some other secondary evidence of the prevailing poison.

Its character may be suspected by the age of the patient, the period of its duration, and other symptoms which may be present; *i.e.* rupial sores in the skin; nodes of the skull or other bones; pains in the limbs or joints; general reduction of health and flesh; and last, not least, the confession (not always to be obtained) of a former primary sore, with perhaps a mark of its recent habitation.

Such an ulceration will usually yield rapidly and satisfactorily to treatment. It granulates, contracts, and cicatrises under the influence of iodide of iron, or iodide of potassium alone; and if thus treated in its earlier conditions, leaves behind but little to mark locally its former existence.

It happens, however, in some instances—whether from neglect, or from misapplied treatment, or from a state of deteriorated constitution—that there arises a greater virulence in this ulcerative action; and that the ulceration spreads not only to the sides and posterior wall of the pharynx, but also implicates the velum and arches of the palate, leaving a very extensive surface entirely denuded of mucous membrane. Under such circumstances, the patient will be found in a deplorable state; he has great difficulty in swallowing, and he becomes greatly reduced from inability to take sufficient nourishment. When under judicious treatment, cicatrisation commences, it will generally be found that as the ulcerated surface contracts, the soft palate becomes displaced, and adherent by its margins to some portion, or occasionally to the entire surrounding surface of the pharyngeal wall. As a result, the soft palate has been occasionally seen adherent to and continuous with the wall of the pharynx, so that all communication between the latter and the nares was entirely cut off. An operation should be attempted partly to relieve this evil; there is usually much difficulty in again preventing adhesions of the parts during cicatrisation; but as the sense of smell is very much impaired as long as the communication between the two cavities is closed, it is most desirable to establish a permanent aperture in the soft palate under such circumstances; and in all probability the perseverance of the surgeon in his efforts to effect it will ultimately prove successful.

Dilatation of the pharynx may occur in two forms; it may be dilated throughout, or only partially. The latter condition is met with occasionally; the former very rarely. The symptoms noticed in cases in which a pouch has been found after death, are difficulty in swallowing much food, and vomiting of food which has been felt to stick in the throat. In one case,* the patient (who died at the age of ninety) was accustomed to press on the pouch and force the food into the œsophagus.

In the Museum of St. George's Hospital is a specimen showing dilatation of the lower part of the pharynx, at a point corresponding to the lower border of the inferior constrictor muscle, and forming a pouch equal in size to that of an gg. The pouch projects downwards behind the upper part of the œsophagus; t is apparently composed of a portion of the mucous membrane and sub-mucous issue protruding through the muscular coats of the pharynx, and does not how any muscular fibres entering into its formation. The upper portion of the harynx is enlarged, and the pharyngeal muscles are hypertrophied. There is o stricture of the œsophagus.

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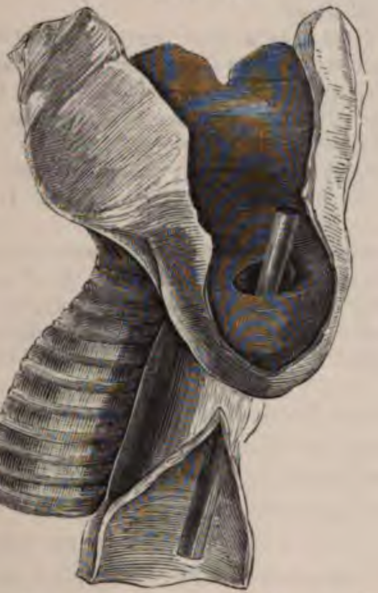
* Museum of Royal College of Surgeons, No. 1886.

FIG. 253.



Pouch of the pharynx. (From a preparation in the Museum of St. George's Hospital. Ser. ix. No. 14.)

The preparation was removed from the body of a man aged sixty-three, who for several years had suffered from difficulty in swallowing. After the conclusion of a meal he was in the habit of returning small portions of food. For two or three years previous to his death he was subject to attacks of inflammation of his larynx, from which he recovered under treatment. His death was the result of inflammation of the lungs. The dysphagia was always supposed to be owing to stricture of the œsophagus.

Tumours attached to the pharynx are not very common. When they occur, they are generally apt to be somewhat pendulous, and are often attached to a portion of the walls by a narrow neck. They have been found to consist of fat, fibrous or fibro-cellular tissue. But the character of the growth is perhaps of less importance as regards the immediate treatment, than the shape, the size, the position, and the attachment of the mass.

The record, with a coloured illustration, of a fatty tumour of the pharynx, is to be found in the *Transactions of the Pathological Society*, vol. v. p. 133, by Mr. Holt. This specimen was removed from the body of a man eighty years of age. Twelve years previously, his attention had been first drawn to his throat, from an occasional sensation of choking. About four years previous to his death, during an attack of vomiting, a large mass was protruded into the mouth; and, to prevent immediate suffocation, he was compelled to return it as quickly as possible. He was at all times better able to swallow fluids than solids. He died suddenly, while in the act of smoking.

The tumour was found to be a large, pendulous, fatty mass, filling the pharynx, and extending downwards to the œsophagus for nine inches. It was attached by fibrous tissue, covered by mucous membrane, to the left side of the epiglottis, and also to the upper part and side of the pharynx. The tumour had by its weight so dragged upon the epiglottis, that the perfect closure of the laryngeal aperture was not practicable. The mass, except at its attachments, was hanging loose in the pharynx and œsophagus. It consisted of adipose tissue.

In the Museum of the College of Surgeons are two specimens of tumours of the pharynx, successfully removed during life. One* is a large, soft lobulated mass, apparently fatty or gelatinous, like a nasal polypus. It was attached by a narrow pedicle behind the tonsil. A second† is apparently a firm, fibrous mass, and was attached by a narrow pedicle to the wall of the pharynx.

Other cases have been observed in which tumours, either of a fatty or fibrous structure, have encroached on the cavity of the pharynx, without becoming pendulous; they have been seen to grow and insinuate themselves under the mucous membrane; and as they increased in size, so they interfered with the aperture of the glottis, and interrupted the passage of food to the stomach.

The treatment of tumours located in and attached to the walls of the pharynx is often attended by much anxiety, as their removal is an operation of much hazard. But that their removal should be had recourse to, and that that removal should be undertaken at as early a stage as possible, we need not attempt to impress upon the reader.

The only hope of benefit must be from treatment restricted to the pendulous form of tumour. The attempt to remove a tumour attached throughout to the walls of the pharynx would be a highly hazardous proceeding, and most probably unsuccessful in its results, if not fatal during its progress. When the tumour is pendulous, no time should be lost before the endeavour be made to remove it. If not large, and attached to the upper part or side of the pharynx, it may be seized with a ulsellum, and the pedicle cut through with a knife. If the ass appears very vascular, or large vessels are detected unning through the pedicle, a double ligature may be first assed through the base, and when securely tied the mass may e with safety cut off beyond it. A ligature through the edicle is far preferable to one round it; for when the mass eyond is removed by the knife, the latter is apt to slip off, and ossibly some hæmorrhage might ensue.

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* No. 1090. † No. 1091.

The chief, and probably the only risk the surgeon has to ear in an attempt to remove a polypoid mass from the pharynx s that of suffocation, produced either by the mass itself filling p the fauces and pressing down the epiglottis, or by spasm of e glottis, the result of irritation from the tumour coming contact with the surface of the laryngeal mucous membrane. the character of the tumour recorded in the *Transactions of Pathological Society* by Mr. Holt be considered—its attach-nts, its size, and the extreme feasibility of its removal, her in great part or in its entirety, *supposing* there was no k of suffocation; if it be remembered that the tumour could t have been drawn into the mouth without the aperture of e glottis being stopped up, but that otherwise the mass might sily have been drawn forwards, and the greater portion moved, would it not be justifiable, we ask, under all such rcumstances, that, prior to an attempt being made to remove ch a tumour the precaution should be taken to perform laryn-otomy, and to introduce the tube into the larynx as a safety-alve for the patient to breathe through while the operation as in progress? We should have no hesitation to perform this peration under circumstances such as were attendant upon the case related, and prior to a proposed removal of a tumour; nor have we any hesitation in strongly recommending the adoption of such a precaution under similar conditions. The operation of laryngotomy is simple; it is so safe in its results, provided the parts are in a healthy condition, that no danger of irritation need be apprehended from the introduction of the tube. The author operated himself, and witnessed several other instances in which the operation had been performed on patients under the care of the late Dr. Marshall Hall for the relief of epilepsy; and in no case was there the least approach to danger from the operation itself, or from the presence of the tube in he larynx. Under circumstances similar to those related by Ir. Holt, laryngotomy would insure the safety of the patient's life during an attempt made to remove a pendulous mass from the pharynx through the mouth; and the tube might be retained until reparation took place in the wound occasioned by the removal of the tumour.

Diseases of the Œsophagus.

Congenital malformation of the œsophagus is rare. It usually proves fatal within a few days of birth.

Dilatation of the œsophagus, and *pouches* connected with that tube, are morbid conditions of occasional occurrence. Cases of the former have been put on record by Rokitansky* and by Dr. Barker.†

Contraction of the œsophagus is a very common evil. It is usually an insurmountable difficulty to the surgeon, and in the majority of cases rapidly reduces and destroys its victim.

Contraction, or 'stricture' of the œsophagus, may be the result of several distinct conditions. Folds of the mucous membrane; cicatrices after injury; pressure occasioned by neighbouring tumours; thickening and contraction of the walls; or, lastly, and most frequently, cancerous affections of the tube, are the chief causes of stricture of the œsophagus.

In the Museum of the College of Surgeons is a specimen (No. 1079) which shows stricture of the œsophagus from a fold of mucous membrane. Just below the cricoid cartilage, the œsophagus gradually contracts to half its diameter, and then dilates. The mucous membrane at the contracted part forms transverse sharp-edged and projecting folds, which pass round the chief part of the circumference of the tube. The surrounding tissues are also condensed, as if the result of cicatrix. There is no history to the specimen. Another preparation (No. 1080) shows a very similar condition in the œsophagus of a child, probably the result of some acrid substance having been swallowed. A preparation removed from the body of a boy ten years of age shows a contracted state of the œsophagus, subsequent to the action of sulphuric acid swallowed during life. With respect to the changes subsequent to the passage of an acrid poison over the mucous surface of the œsophagus, Rokitansky remarks that when 'the mucous membrane has been destroyed by the energetic action of the poison, it is replaced by serous and sero-fibrous tissue, which gives rise to peculiar valvular strictures of the œsophagus, somewhat analogous to those consequent on dysentery.' ‡

In the Museum of St. George's Hospital is a preparation of a portion of an œsophagus, in which may be seen a constriction about three inches from its upper extremity—the result of a piece of bone becoming impacted for a time in the passage, and having set up inflammation around the part. This mischief extended to the præ-vertebral areolar tissue of the cervical region, followed by ulceration of the inter-vertebral cartilage of the third and fourth cervical vertebræ. The ulceration went on to perforation of the spinal canal, and produced inflammation of the membranes and softening of the spinal cord. The piece of bone, of considerable size, had stuck in the throat for a time, but was subsequently removed. Large quantities of pus were afterwards spat up.*

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* *Path. Anat.* vol. ii. p. 8.

† *Path. Soc Trans.* x. 140.

‡ *Path. Anat.* vol. ii. p. 10.

Simple stricture of the œsophagus, from thickening and contraction of its walls, is occasionally met with, and apparently without satisfactory explanation. Mr. Liston exhibited at the Pathological Society a specimen possessing some interesting features. The stricture existed at the upper part of the tube, was about an inch in length, and only capable of allowing the passage of a goose-quill. The contraction had existed for a number of years; there was considerable hypertrophy of the constrictors of the pharynx, especially of the superior one. The upper horns of the thyroid cartilage were so approximated as to leave but a space of $\frac{5}{8}$ths of an inch, being a diminution of about an inch in the breadth of the natural interval between them. The patient had been under the care of Cruikshank and John Hunter, and lived to between seventy and eighty.

It is unnecessary to multiply instances of these forms of contraction; there are, however, certain circumstances in connection with their progress, which will form the subject of consideration when their diagnosis and treatment are discussed.

Complete obstruction to the passage of food from the pressure of a tumour on the œsophagus is very rare. Occasionally some degree of difficulty in swallowing is experienced, from the presence of a tumour of a cancerous nature; or from the thyroid, when very large, or when it wraps round the trachea; or from an aneurism or any other kind of swelling in the neck.

Evidence of supposed pressure from a tumour, must, however, be carefully weighed, before a decision be arrived at respecting its influence in this respect. Dr. Wilks † has very properly drawn attention to the circumstance, that obstruction has been attributed to an exostosis of the vertebræ when actual disease of the œsophagus and stricture existed above the seat of the exostosis.

The most frequent causes of obstruction to the passage of food, attended by rapid deterioration, and followed by early death, are cancerous affections of the œsophagus. They occur in various forms. The epithelial variety of ulceration with contraction is most common, but medullary, villous, or colloid cancer occur somewhat in proportion to the order in which we have placed them.

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* *Post-mortem Book*, 1852, fol. 36.

† *Path. Soc. Trans.*, vol. xii. p. 101.

Cancerous ulceration or stricture of the œsophagus is a disease of age. We are not aware of its occurrence in youth or early life. Rokitansky states that 'cancer of the œsophagus generally occurs in an isolated form, *i.e.* without the co-existence of the disease in other organs.'* Such is no doubt often the case, but the rule is made too general to be correct; the reader may satisfy himself that we differ with the great pathologist on reasonable grounds, by reference to the *Transactions of the Pathological Society.*

The usual symptoms of stricture are, first, a slight difficulty in the passage of solid food to the stomach. The difficulty gradually increases; sooner or later the patient is compelled to restrict himself entirely to food of a fluid form. By degrees he finds that this he can take only in gradually reduced quantities, until at last he sips but a few drops at a time; or even this small quantity may be rejected, shortly after an attempt made to swallow it.

A patient with stricture of the œsophagus rapidly emaciates: he visibly deteriorates in physical power and in substance from day to day; the circulation becomes feeble, he complains of a sensation of cold on temperate days, and he becomes very susceptible to all changes of the atmosphere.

If there be ulceration in the upper part of the œsophagus, or the pharynx be also implicated, there is generally a disagreeable smell in the patient's breath, easily detected by a visitor on entering the room. The patient is often subject to expectoration, and the secretion spat up is semi-purulent, and occasionally very offensive. He complains of intense hunger in the earlier period of the disease, and when solid food can no longer be taken; but gradually he succumbs to the privation, and latterly is often indifferent respecting it.

When once the patient is restricted to fluid nourishment alone, the quantity taken is by no means sufficient to sustain life; so that the medical attendant may predict the approaching end as not far distant, when perhaps the patient or his urrounding friends may be little prepared for such an announcement.

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* *Pathological Anatomy,* vol. ii. p. 12.

Occasional complications occur in the progress of stricture of the œsophagus to which our attention is requisite; they render the disease more distressing to the patient, but generally hasten the termination of his sufferings. The epithelial variety of ulceration is apt to spread superficially without destroying the tissues deeply; and though a large surface may be implicated, the patient so affected will survive longer than one affected by the medullary form of cancer. With the latter form of disease the surrounding tissues become implicated at an early period, and thus the passage may become much constricted soon after the stricture is suspected. Ulceration of the tube above or about the diseased mass will generally take place, and cavities in the cellular tissue around will be constantly found communicating with the ulcerated points of the œsophagus. Occasionally the destruction makes its way outwards, until several openings are formed externally about the neck, and allow the escape, not only of matter, but also of the fluids taken as nourishment. Or the ulcerative action may run in a different direction, burrow about the muscles of the neck, or effect a fistulous communication with the trachea. The latter condition is made evident by fluids, taken through the mouth, being coughed up through the glottis.

In other instances, almost instantaneous death will occur from sudden and violent hæmorrhage, dependent on the ulceration of a large artery.*

The symptoms of stricture of the œsophagus are so marked, that it might at first sight appear almost impossible to be deceived regarding its occurrence. But an hysterical spasmodic condition of the pharynx or œsophagus is occasionally met with, and might be mistaken for organic mischief, without some precaution and judgment brought to bear on the case. It is therefore prudent to weigh carefully the symptoms of all cases of supposed stricture of the œsophagus, in order to be able to discriminate between actual stricture, and that of nervous origin. The latter disorder is not very commonly met with; but it will be found, as a rule, to occur in women. In two instances familiar to us, the symptoms were evidently entirely due to the state of health, and yielded effectually to constitutional treatment. The symptom which commonly distinguishes an hysterical or spasmodic difficulty in swallowing from a real stricture, is the easy manner in which a patient can swallow fluids, or even solids, when allowed to take them apparently unobserved. There is little, if any, emaciation; nor is there the early indication of loss of strength; nor the constant desire for food if it could only be swallowed.

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* A case is recorded in the *Transactions of the Pathological Society* (vol. ix. p. 194) of death by hæmorrhage from ulceration extending from the œsophagus to the right subclavian artery. And a second instance is found at page 202 of the same volume, in which death was the result of perforation of the superior intercostal, by extension of ulceration from the cancerous stricture. The vertebral artery has been known to be perforated under similar conditions.

The diagnosis of stricture of the œsophagus is generally very easy and sure. It comes on after mid-life. The patient experiences a constant craving for food, but an inability to partake of it. He longs for it, and would at any moment partake of a large meal, if it could possibly pass to the stomach. 'You know nothing of the pangs of hunger,' observed an eminent member of our profession, when dying of cancerous stricture of the œsophagus. 'Day and night I suffer horrible tortures from absence of food from the stomach; but I can swallow nothing.'

When a pouch of the pharynx or œsophagus exists, it may be suspected, if, after partaking of food, the patient feels any fulness in the neck, or if, after a time, a portion of the meal is returned. As the pouch is capable of holding a certain quantity, there is not so much difficulty in disposing of a portion of solid food as in stricture; for a part may pass into the œsophagus, and the rest into the pouch. A patient suffering from a pouchy condition of the tube does not emaciate so rapidly as one affected by stricture; several instances on record having lived to a good old age.

The treatment of stricture of the œsophagus is summed up in a very few words.

If hysterical, general constitutional treatment will overcome it, without much difficulty, in a comparatively short time.

If permanent, from cicatrix, or other disease, we can offer very little hope of benefit from treatment. When the result of cicatrix, or supposed folds of mucous membrane, the application of caustic has been recommended and tried. The use of bougies has perhaps been followed by some partial relief. But all treatment is, at the best, unsatisfactory. When cancerous, the treatment most suited to relieve suffering, and to soothe the distress of the patient's closing days, is the administration of enemata of strong beef-tea and laudanum; and at the same time, the allowance of whatever fluid he relishes, either to wash out the mouth, or to swallow. The enemata may be repeated with great benefit every four or six hours, according to the feelings or wishes of the patient. Such treatment will prolong life some days; and it may be a matter of very considerable importance to the surviving members of a family, that a life should be prolonged over a certain period, not far distant, when the medical attendant is first consulted.

We cannot recommend the use of bougies in the treatment of stricture of the œsophagus. In its early stage, curiosity may perhaps require to be satisfied by an exploration, so that the exact seat of the stricture be ascertained; and to such a proceeding there is no great objection. But, beyond this, very little, if anything, is gained by such treatment. In attempts made to pass a bougie through the stricture, the end of the instrument has been known to find its way into the mediastinum; into the cavity of the pleura; and into the cavity of the pericardium. In each instance the instrument was used by skilful hands; but, in all the cases, rapid death supervened upon the severe symptoms which followed the withdrawal of the bougie.

It is wise in such cases to refrain from interference without some certain prospect of good; for in these cases, as in all, meddlesome surgery is bad.

GEORGE POLLOCK.

DIPHTHERIA AND CROUP.

A FEW years ago the name of Diphtheria was unknown in England. It is highly probable that the descriptions of some of our older writers refer to this disease, which no doubt appeared then, as now, in an epidemic form; but for a very long period England had been free from its presence, and our acquaintance with its symptoms and consequences was till recently wholly derived from observations made in France, where it had been known and studied for a number of years. Prior to 1850, it must be confessed that a lingering doubt remained in the minds of many on this side the Channel, whether it did really differ from our own croup, or might not perhaps be explained merely by an unusual prevalence of croup during the existence of an epidemic of scarlatina. Careful observation seems to show that it is distinct from both these diseases, but that its relationship is in many respects so close that no better description can be given to one not conversant with the disorder than that it holds a place intermediate between them. It partakes of the febrile character and epidemic influences of the one, and of the specific exudation of the other; it combines general symptoms which belong specially to the fever, with local symptoms which belong wholly to the inflammation: and when it kills, it does so either by the general exhaustion which characterises more or less all epidemic diseases, or by the suffocation which depends on the exudation of fibrine, exactly like that which occurs in croup.

With all this, it is a very remarkable fact that the spread of diphtheria generally coincides with the prevalence of scarlatina. Since it first made its appearance in England, the same observation has come from so many quarters that it is impossible to regard it as a mere coincidence. Indeed it has formed one of the great obstacles to our acquiring definite information regarding it, that the two diseases have so constantly run alongside f each other, and so completely merged into one another, that t has been difficult to separate them, and to distinguish between the effects produced by each. It has not unfrequently happened that in the same family, within a very short period, one member has suffered from diphtheria, and another has had an attack of scarlatina, and each has been so marked as to leave no doubt on the subject: but if the cases were not so clear, or if, as has often happened, the question of diversity were never raised at all, the two sets of symptoms would be set down to the same cause, and false inferences drawn as to the true character of the disorder.

This circumstance has no doubt given greater vagueness to the descriptions of the older writers than would otherwise have been the case, but the conclusion is unavoidable that cases occurred in their practice also, and that doubts have often arisen as to whether it was or was not a form of scarlet fever. They were not conversant, as we are, with the exudation-process, and did not discriminate between patches of lymph resting upon the surface of the mucous membrane, and a slough involving its superficial layer. They were, indeed, surprised that when the layer was detached, the membrane was found healthy beneath it; but pathology was not sufficiently advanced to draw intelligent conclusions from such observations, and we can gather little from the past that can be of use in the consideration of the special character and treatment of this disease.

History.—The first observations which, in this country at least, led to a true understanding of the nature of that false membrane which so eminently characterises diphtheria, were made with reference to sporadic croup by Dr. Home,* about the middle of last century. He first recognised the existence of a mass of fibrine, moulded to the form of the subjacent structures, and adherent to the mucous membrane, but lying quite upon its surface, 'and generally lying loose upon it.' Prior to this date such exudations were supposed to be part of the membrane itself, detached in the form of a slough. His descriptions, as well as those of Dr. Cheyne,† forty years later, prove that in the sporadic croup of their day the exudation was confined to the trachea, and did not spread to the fauces.

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* *An Inquiry into the Nature, Causes, and Cure of the Croup,* by Francis Home, M.D.

† *Essays on Diseases of Children,* by John Cheyne, M.D.

So truthful were these descriptions of croup, and so entirely did they correspond with the experience of British practitioners, that we were for some time disposed to doubt the correctness of our neighbours' observations; just as they imagined that there must be some error in our way of regarding croup, because it was so unlike what they were studying in the epidemic sore throat, which some years ago began to attract attention in France. Yet each set of observations was true in its own place; the two diseases were perfectly different in their origin, although they presented the curious coincidence of the exudation of false membrane, at that point where its presence interfered with one of the most important functions of life, and not unfrequently caused death by suffocation.

Bretonneau, in his Memoirs* read before the French Academy in 1821, was the first to give a scientific account of the epidemic disease; and its symptoms have undergone so little change, that his report continues to be a very faithful picture of the usual forms which it presents, although his theory of the local character of the disease has been now almost entirely abandoned. Till very recently this view was maintained by many of the best French pathologists; and Trousseau has perhaps been the last to yield the point, that the empoisonment of the blood, as exhibited in the general symptoms, was not merely a consequence of the local affection, and of the absorption of some material connected with the exudation. This question, though in itself one of mere abstract reasoning, which could be put to no precise test of its truthfulness, yet reached far beyond the battle-field of opposing theorists; for it offered a satisfactory reason for endeavouring promptly and effectually to remove the exudation by local applications, while it led to the overlooking of such measures as were calculated to counteract a blood-disease, which it was assumed could be prevented or cured only by the removal of the local affection. The practice thus introduced has continued more or less to form the basis of very many of the modes of treatment, and with too many the aim has only been to discover the most efficient local remedies, instead of seeking to overcome the general disorder of which we now believe the exudation to be only a part.

Symptoms.—The main symptom on which reliance is placed in the diagnosis of diphtheria, is the presence of false membrane.

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* See *Memoirs on Diphtheria*, published by the New Sydenham Society.

Like many other diseases with which we are only imperfectly acquainted, one prominent symptom, the first indeed which led to the recognition of its separate and distinctive character, has almost usurped the place in nosology which belongs to the blood-poison which gives it birth. But the more we are compelled in our ignorance to rely on one pathognomonic sign, the more surely are we exposed to the risk of error in the conclusions at which we arrive. The characters of the sign may seem to be very definite when a well-marked example is presented to us; but if it be at all obscure, we are forced to look for other indications to aid our judgment. In the investigation of diphtheria we are met on the threshold with a very prominent fact, which gives it a place at once in our nosology as a blood-poison; for so we must at present call it, while confessing our ignorance of what blood-poisoning means. It comes to us under the form of an epidemic; it attacks one individual after another; it breaks out in a given locality; singles out a certain proportion of the community for its victims; and then disappears. We ask how it came, and how it went; and the answer must be necessarily somewhat vague. Sad experience has proved that persons who have been accidentally inoculated, so to speak, with the exudation, have caught the infection and suffered from the disease. And as with other inoculable diseases which are also certainly conveyed from the sick to the healthy through the atmosphere without actual contact, so with this there seems every reason to believe that in certain investigated instances the infection has been so propagated; and we can hardly withhold our assent to the proposition that it may be so in all, although it is not always, perhaps not often, possible to trace the source of the infection, and the means of its transmission. It matters not, however, whether the theory of the contagionists or of the non-contagionists be proved the true one; the fact still remains, that diphtheria has all the known characters of an epidemic. It is not meant to assert that no isolated case can be diphtheria, but all such must ever be received with suspicion; and if the case be really isolated, it will probably be found wanting in some of the distinctive characteristics of the disease, and may possibly be referred to some other form of throat affection.

But while it is admitted that the epidemic character is essential to the existence of diphtheria, it is somewhat difficult in the presence of an epidemic to discriminate cases which might have occurred as simple sore throat in its absence. The mucous membrane is perhaps only redder than usual; it may have a slight glazy exudation, or even that may be wanting. And the chief peculiarity consists in the cases being very numerous, and there being no tendency to suppuration or ulceration, as the result of the inflammatory action. Such affections of the membrane of the throat always accompany the spread of the genuine diphtheritic inflammation; and our definition must be made wide enough to embrace them, because although the chief pathognomonic sign be wanting, yet they are, without doubt, part of the epidemic, and quite as essential to a right understanding of the disease as the more marked forms to which the name is more truly applicable.

Definition.—Diphtheria may, then, be characterised as a blood-poison propagated by transmission through the atmosphere in the majority of instances, either as a miasm from the bodies of the sick, or in consequence of some atmospheric changes as yet unknown to us. This poison, after the lapse of a very few days from the date of exposure to infection, produces a general febrile action throughout the body, and a distinct local inflammation limited to the membrane covering the throat. Quite exceptionally, deep-seated abscess may form in consequence of it; but most commonly there is only simple inflammation of the glands of the neck, which are tense and tender: these accidents, however, are not essential to the disease in the same sense as the specific action on the mucous membrane.

Albuminuria.—In addition to this, an albuminous state of urine is very common in the severer forms of diphtheria. As in scarlatina, the presence of albumen is simply due to congestion of the kidney; and we conclude that in some way or other the vitiated or poisoned blood stimulates the capillary vessels so as to produce this state of congestion; but we have as yet no clue to unravel further the mystery. In the one disease the urine presents no trace of albumen during the acute stage, the congestion only appearing with the desquamation of the cuticle after the febrile condition—the scarlet fever, so to speak—has passed off; in the other it commences at a very early period of the disease, generally lasts only for a few days, and does not cling to the patient during convalescence, as is the case so often in scarlatina. It causes no surprise that we cannot explain these peculiarities, since we have no idea why the complication exists at all, when it does not accompany any other form of sore throat, nor to the same extent any other febrile disorder.

Paralysis.—Another phenomenon accompanies or rather follows upon attacks of diphtheria with sufficient frequency to establish a certain relationship between them; but as yet we can only affirm that paralytic affections may be apprehended after partial convalescence from diphtheria—after, indeed, the throat has got perfectly well, and nothing seems wanting to recovery but the due performance of the nutritive functions. This must be the gravest of the sequelæ, if it be true that patients die of paralysis of the heart* when no lesion whatever can be traced after death. The paralysis most frequently affects only the muscles of deglutition and of speech, but does also sometimes include nearly all the muscular tissues throughout the body; the sight becomes impaired through loss of the adjusting power of the eye,† the pulse fails, apparently from diminished nervous energy in the heart, the legs and arms become partially powerless, and sensations of tingling and numbness are complained of, or actual anæsthesia exists.

Diphtheritic fever.—The primary action of the poison when imbibed into the system is an alteration in the character of the blood. This we infer, in the first place, from the sense of malaise, the febrile action, in some instances very slight indeed, but in some very severe, which can be traced before any local manifestation occurs. This fever alone may kill, and when it does so, it is always by its assuming an asthenic or typhoid character; the patient either becomes daily weaker, and ultimately dies of exhaustion, or the case is marked by low muttering delirium, with a tendency to slough about the inflamed mucous membrane, excessive prostration, and rapid sinking; in either case the pulse is feeble and very frequent. It is to be borne in mind that this is the invariable character of the disease, however inflammatory the fever may in the first instance seem to be. In the second place, we infer the existence of blood-poisoning from the occasional appearance of purpura and sanious exudations in fatal cases, and the constant sequel of intense anæmia, even in comparatively mild cases, during convalescence.

These peculiarities are very striking, because the depression resulting from the attack is out of all proportion to its severity, and even when the fever is manifestly typhoid in its character, the subsequent weakness seems very much greater than might have been anticipated, and may end in a gradual but total failure of vital power after all danger had seemed to be at an end.

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* *Diphtheria, its Symptoms and Treatment*, by Wm. Jenner, M.D., pp. 42–59.

† *Diphtheria*, by E. H. Greenhow, M.D., p. 229.

The fibrinous exudation.—The next immediate effect of the poison is the local action on the mucous membrane of the throat, which looks from the first swollen and red, as if it were the seat of active inflammation. And such no doubt it is; but it is a specific, and not an ordinary inflammation. It is quite different in its character and consequences from the ordinary inflammation of mucous membrane, and bears some analogy to that which is more commonly restricted to serous membrane; differing from it most, perhaps, in its tendency to localisation. We are all perfectly familiar with the rapid spread of the inflammatory blush, from a single point, over the whole involutions of the peritonæum, with its sticky, glazy, and fibrinous exudation; we see the same exudation forming a thick shreddy coating all over the heart, or lining the entire cavity of the pleura. In diphtheria we have the same character marking the exudation, but the parts involved do not extend as far as the limits of the membrane. In many cases the patches of lymph are few and small, and the inflammation is confined to the back of the throat. In a certain number of instances the trachea, and even the bronchi, are involved; not unfrequently the membrane lining the nares is attacked more or less extensively; more rarely the exudation travels down the œsophagus; and in a few cases it reaches up the lachrymal duct to the surface of the eye. The laws of its extension seem to be much more in harmony with those of mucous than of serous inflammations, and there is but little difference in this respect between diphtheria and ordinary sore throat, which may either be limited to the fauces, or may be the commencement of a catarrh, ending in general bronchitis. The character of the exudation varies much in the same manner. When the extent of inflamed surface is small, the effusion is scanty, and the deposit of fibrine of less thickness and consistency; when the inflammation is more extensive, it is generally also more intense and the effusion is thicker and denser, deeper and firmer. But there is no absolute rule in this respect. The fibrine is exactly analogous to that which usually covers inflamed serous membrane, presenting not only the same general appearances, but also the same microscopical elements.

It was at one time supposed that the discovery of a microscopic fungus had given an explanation of the whole pathology of diphtheria. Competent observers have, however, shown, not only that the exudation may exist without any trace of the parasite in its substance, but also that the very same form of vegetable life may be seen occasionally in some of the secretions of the mouth when no symptom of diphtheria, and no exudation of fibrine, had been present.

The ordinary consistence of the effusion is such that it is often called false membrane; but it is sometimes scarcely more cohesive than paste, and contains more granular matter and cells than fibre in its structure. The mucous membrane on which it rests is almost always redder than usual; and when the fibrinous layer is removed, it looks raw and irritable, as if denuded of its epithelium; it is generally also dotted over with bloody points where the adhesion has been closer, or the exudation has entered the mucous follicles, and torn the tissue in its removal.

The diphtheritic exudation is not, however, confined to the mucous membrane of the throat, although probably always to be found there in a true case of diphtheria. It is to be seen very constantly on the skin when the cuticle has been removed by a blister; and it is alleged that the contagion of the disease has pread in this way to persons who have had blisters applied while living in rooms where others have been suffering from diphtheria. Any ulcerated or abraded surface, in persons labouring under the disease, may similarly become coated with false membrane; and not unfrequently the mucous membrane of the pudenda in female children is the seat of a similar exudation. Suppuration of an unhealthy kind sometimes attacks the mucous membrane beneath the exudation, which melts away with a gangrenous odour, leaving a slough or a foul ulcerated surface behind; and then the whole course of the disease may be changed, and the patient may fall into that low typhoid condition which is believed to be caused by the absorption of unhealthy pus.

The mere fact of exudation having taken place, apart from its value as an indication of the severity of the attack, claims our most earnest attention, from its occasional bearing on the issue of the case as a local complication. It is not the extent of surface attacked which excites apprehension, but the importance to life of the narrow chink through which air is drawn into the ungs, and the readiness with which a very small amount of thickening, or a very slight deposit on the membrane covering the chordæ vocales, may obstruct the entrance of air, and cause death by suffocation. It would appear that in different epidemics the tendency of the inflammation to spread to the larynx has varied very greatly; sometimes a majority, sometimes but a small number of the deaths resulting from this circumstance.

It is at this point that the epidemic disease comes into close relationship to the endemic inflammation of the trachea in children, known as croup. The termination of the case when death results from apnœa is identical in both diseases; the fibrinous exudation, so unusual in inflammation of mucous membrane, is also apparently identical, but, so far as we know, the cause is different. The diseases appear to be entirely distinct: the one communicable, the other having no tendency to spread; the one a simple inflammation, the other a specific fever; the general disturbance in the one case only such as is produced by the local inflammation and the difficulty of breathing, while in the other the local disorder is only one manifestation among many of a previously existing condition of blood-poisoning by which the fever is caused.

Treatment.—The fatal termination of an attack of diphtheria may follow either as a remote or immediate result of the fever itself, or in consequence of the obstruction of the larynx by local exudation; and the treatment must vary as the one or the other of these circumstances seems to be the most fraught with danger. Like the other acute specific diseases, diphtheria must be treated on general principles, inasmuch as no specific remedies have yet been discovered which have the power of destroying the blood-poisons on which they severally depend. Probably no such remedies exist. The condition of the blood during the incubation of a fever, while an infinitesimal portion only of the poison has been absorbed, must be very different from that in which the poison is again generated in unmeasured quantity, and is passing off from the patient's body to attack others who are brought within its range: and a remedy which might avail in the one condition would be useless in the other. If, as we apprehend, diphtheria is in this respect analogous to small-pox, the plan of treatment must necessarily vary with the duration of the disease, the intensity of the blood-poisoning, and the power of resistance on the part of the patient. Any specific, if such there be, can only act as a preventive, hindering the blood-changes from commencing, and cannot very well be supposed to put a stop to their progress when fully developed. The spoilt material can only be got rid of by elimination; fresh blood must be formed to take the place of that which has undergone a process of deterioration. On these broad principles must our reatment be based with reference to the fever itself; the local disease demands separate attention and different remedies.

1. In some rare cases the patient is at once prostrated by the severity of the fever; he has a brown tongue, a quick and feeble pulse, probably purpurous spots on his body, or a sanious discharge from the nose or fauces, and occasionally muttering delirium. Such cases rarely show any signs of rallying; and the freest use of stimulants affords the only chance of saving the patient or enabling him to recover from the shock of the attack.

2. If not thus prostrate from the very first, yet generally from an early period the tendency of the disease is to assume a low or asthenic type; and depressant remedies must be carefully avoided. In some cases the local inflammation is severe, and the fever is proportionately acute, and for a few days mild salines may be indicated; but even such treatment must not be persevered in too long, and the depression which follows must be met or even forestalled by the administration of stimulants. The difficulty of swallowing must not be permitted to interfere with the quantity of nourishment taken; patients who escape the first severity of the disease are still exposed to the danger of a lingering convalescence, or a gradual exhaustion of the vital powers; and hence the importance of a sustaining mode of treatment. Chlorate of potash, hydrochloric acid, and muriated tincture of iron, are the constitutional remedies on which, according to the testimony of most writers, the greatest reliance is to be placed, combining them with diffusible stimuli or tonics, as the particular case seems to require. Each has been vaunted in turn as almost specific, and each has notably failed where it has been so misapplied. Chlorate of potash acts so completely as a charm in some cases of cancrum oris, that it is not unreasonable to suppose it may act beneficially where there is any analogous condition of the mucous membrane; in the purely non-ulcerated form of diphtheria, it is less likely to do good. Hydrochloric acid, either alone or in combination with the chlorate, is well known as a gargle and drink in scarlet fever. It seems to act partly as a local stimulus to the throat, and partly as a general blood alterative, especially in those forms of the disease in which the appearance of purpura or sanious discharge proves that important changes have taken place in the condition of the blood.

Iron in all its forms is so distinctly the remedy which tends to restore the blood to its healthy condition, that its use cannot be dispensed with in a disease of which blood-changes are the commencement, and anæmia the usual termination. The tincture of the perchloride has appeared to act most beneficially in some cases of erysipelas, and its local astringent action seems to render it especially suited for the treatment of this disease. In some cases it has certainly answered even beyond expectation.

3. Foul and unhealthy suppuration not only aggravates the general disorder, but may lead to the supervention of blood-poisoning of another kind. Pyæmia, as it is called, must be regarded as a most dangerous complication of diphtheria. Ulceration of the mucous membrane shows that the vitality of the patient is low, and calls for increased activity in the administration of stimulants and tonic remedies, while every attempt is made to convert the foul suppuration into a healthy sore, to prevent the possibility of the absorption of unhealthy pus into the system. If secondary abscesses begin to form, the liberal employment of wine and brandy, with large doses of opium, gives the only chance of recovery. The extent to which both opiates and stimulants are borne in such cases is quite surprising.

4. The local disorder claims our attention more especially when it spreads towards the larynx and trachea. The idea that the extent of the exudation was the cause of the severity of the symptoms has been entirely abandoned, and with it that meddlesome activity which deemed it necessary to apply caustics or astringents several times a day to the throat. An abraded surface, whether of cuticle or of mucous membrane, is speedily covered with the diphtheritic exudation in the severer forms of the disease, even when no contact of parts is possible; and it would seem perfect madness to apply an escharotic which tends to denude the adjacent membrane of its epithelium, and prepare it for the fibrinous exudation which is certain to take its place. Such treatment, however, has been adopted, under the mistaken idea that local means could check the constitutional malady. The circumstances which seem to demand local applications are the rapid spread of the exudation, and the existence of ulceration. The application must be astringent, not escharotic; a stimulant to the diseased surface, not a destroyer of its vitality. By occasional sponging with a solution of the perchloride, or a very dilute mineral acid, or a weak solution of lunar caustic,

we may hope to prevent the exudation reaching the larynx, or the ulceration assuming an unhealthy character; but the power of such means is allowed on all hands to be very limited.

When the larynx is also involved in the exudation, dyspnœa, and insufficient aëration of blood, add very materially to the sufferings of the patient, and the probability of a fatal termination; and the question naturally presents itself, whether any, and how much, benefit may be anticipated from the operation of tracheotomy. It is by no means easy to give in few words a definite answer to this inquiry, or to lay down rules which may be sufficient to guide the practitioner in deciding on his course. If we turn to statistics, we find that the fatal termination is not averted to any great extent, although in all probability some lives have been saved by the operation, which must otherwise have been lost. But it is manifestly impossible to frame a series of cases in which it has not been performed which shall be an exact counterpart to those operated upon; and without such a basis of comparison, the knowledge of the exact number of deaths and recoveries after operation is valueless. It is indeed asserted that of late years the mortality in France after tracheotomy is not nearly so great as formerly; but this may depend not so much on the results being more favourable, as on a more hopeful series of cases being selected. In such circumstances we must be guided more by general principles than by experience, and the rules for our guidance must be admitted to be based partly on conjecture. It may be assumed, then, first of all, with tolerable confidence, that when the general symptoms indicate that the attack is comparatively mild, while the danger of suffocation is imminent, tracheotomy does give a chance of life in cases otherwise all but hopeless, and that it certainly does give prompt and certain relief to the suffering immediately caused by dyspnœa, than which nothing is harder to bear. But no surgeon ought to undertake the operation, even in such circumstances, without fully explaining that relief, and relief only, from impending suffocation is its object. Secondly, when the dyspnœa is less intense, it becomes a question, whether the relief to the breathing may not help forward the process of cure which nature is working out; or it may rather be said, whether the existing amount of dyspnœa does not materially hinder the recovery, and render it more uncertain. The French surgeons are disposed to answer in the affirmative; and the opinion is shared by many among ourselves; but the practice is clearly not one that can be urged as necessary in the present state of our knowledge. Thirdly, in the very severe forms of the disease, we may well pause before recommending the operation, because it is no longer a question of the possible saving of life, but one merely of giving temporary relief. The patient is in a condition most unfavourable for the operation; and even setting aside the chances of an immediately fatal result, the fact of the operation having been performed is very apt to tell unfavourably on the issue. In addition to this, we must remember that the operation may even fail of giving relief in consequence of the trachea and bronchi being blocked up by false membrane. In such cases it can only be justified by intense dyspnœa and impending suffocation, and by the earnest longing of the patient, or the friends, to have something done to procure relief. Could we know with any degree of certainty how far the exudation extended into the trachea and bronchial tubes, we should have most valuable information to guide our decision. Auscultation should with this view always be carefully practised; but it must be confessed that the determination is a matter of extreme difficulty, and one in which the most experienced stethoscopist may fail to elicit any accurate or trustworthy information.

5. During the prevalence of the epidemic many slight cases occur, which assume more or less its specific characters, and are marked by the presence of small shreds of lymph on the fauces. An ordinary sore throat at such times does not follow its usual course, but without manifest exposure to infection is somehow assimilated to diphtheria. These generally require no special treatment, and will in all probability end in recovery without the aid of medicine. We have only to remember the tendency to depression which accompanies all the well-marked instances of the disease, and therefore in all cases we must carefully avoid any lowering remedies. No good can result from the local application of escharotics, while some risk is run of causing the exudation to spread more than it would otherwise do. Many a diphtheritic-looking throat has been produced by the unnecessary application of lunar caustic in doubtful cases.

CROUP.

General characters.—With the disease known by the name of croup, or tracheitis, as it has been sometimes called, the cynanche trachealis of Cullen, English medical men have been long familiar. Although occurring in particular localities at certain times with greater frequency than elsewhere, it presents none of the true features of an epidemic; it is much more truly endemic. It appears chiefly during the cold weather; it may visit the same locality year after year, wholly disappearing during the interval; but it does not spread to adjacent houses or villages, its victims being comparatively few, although several persons are usually attacked at or about the same time. In all these respects it has much more affinity with pneumonia than with such a disorder as diphtheria. Like the latter, however, it is marked by one very striking feature, viz. the existence, in a large number of instances, of false membrane as an exudation from a mucous surface.

With our present knowledge it is impossible to assign any reason for this peculiarity. There is no specific poison apparently introduced; the mucous membrane lining the larynx and trachea is simply inflamed; and in many cases the exudation is purulent or creamy-looking; but in the majority it is fibrinous, contrary to the usual laws governing the inflammations of mucous membrane. Why this is so, we know not; for an acute attack of bronchitis or lobular pneumonia, both not uncommon in children of the same age, is not attended by the same sort of exudation from the mucous surface of the small tubes. It is usually only when the inflammation attacks the trachea, and is localised there, that false membrane is formed; but cases are occasionally met with in which the same material may be found lining the bronchial tubes down to their minutest ramifications. It is scarcely to be hoped that we shall ever attain to a knowledge of the circumstances which determine why one exposure to cold is followed by inflammation of the parenchyma of the lungs, another by that of the lining of the small tubes, while in a third the membrane of the trachea is alone the seat of the inflammation. It is this tendency to limitation which constitutes the specific character of each inflammation, and thus distinguishes croup from laryngitis on the one side, and bronchitis on the other. The peculiar form of the exudation is not less characteristic of croup when it is observed, in as much as it does not accompany the other forms of pulmonary inflammation; but it is never safe to take any one symptom as pathognomonic of a disease, however close the relationship; and mistakes are constantly being made by those who rest satisfied with such methods of diagnosis.

The attack ordinarily sets in with acute febrile symptoms and a hard dry cough, which has a very peculiar sharp ringing sound, dependent on the changes which from the first occur in the larynx and trachea. The sound of the cough is so remarkable, that, when a child produces this brassy tone in coughing, the attendant is tempted to conclude, without further inquiry, that the disease is croup. There is very generally no difficulty in swallowing, any feeling of soreness of throat being confined to the windpipe, and not reaching the fauces. In some few instances, however, the inflammation is more general, and false membrane is seen on the tonsils and the back of the throat, just as ordinarily happens in diphtheria. The breathing is always hurried, partly as a consequence of the febrile state, partly because air enters the lungs with difficulty. As the disease proceeds, this difficulty increases, and the dyspnœa recurs in paroxysms, which become every hour more distressing. Such paroxysms often follow a fit of coughing, but occasionally come on without any apparent cause. In the expectoration shreds of false membrane are often seen, and considerable relief sometimes follows its removal; but in the severer forms of the disease the relief is only temporary—the exudation is renewed as soon as it is rejected, the breathing becomes more and more oppressed, the skin acquires a dusky hue, and ultimately is covered with cold perspiration. After several severe and ineffectual struggles for breath, the brain seems to be stupefied by the circulation of imperfectly-ventilated blood, and the patient sinks into unconsciousness.

Diagnosis.—The site of the inflammation is specially the trachea; but its great fatality depends upon its involving also the larynx; and this circumstance directs our attention to the inflammatory action going on in that part of the breathing apparatus more than to the condition of the trachea itself. Laryngitis is a disease of adult life; tracheitis is limited to childhood: hence, if the difficulty of breathing is caused by some condition of the larynx, we almost at once assume that in an adult we have to do with laryngitis, in a child with croup, when febrile symptoms are present, and there is nothing visible about the throat to account for the dyspnœa. Indeed we need hardly go any further in distinguishing these two diseases, because if false membrane be present, its appearance in the expectoration will very soon remove any doubt. From bronchitis and pneumonia it is distinguished by the cough, by the existence of dyspnœa, and by the fact of this dyspnœa being traceable to the larynx. The spurious or false croup is much more sudden in its onset, and transient in character; the one disease is essentially febrile and inflammatory, the other spasmodic, free from fever, and dependent on nervous irritability. Between diphtheria and croup the relations are very close; and although it be quite true that the original site of the exudative inflammation is in the former the fauces, in the latter the trachea, yet there are instances in which at present the name given to the attack must depend simply on the consideration, whether the case occurred sporadically or was one of such a number as could only be caused by epidemic influence. The cases which cannot be determined by this rule are comparatively few; and during an epidemic, genuine cases of croup may very generally be distinguished, even though the epidemic element impresses on them, to a certain extent, its own characters and features. The chief symptoms which must be relied on for this discrimination are also those on which the treatment of the two forms of disorder is in great measure based; they are those which characterise the one as a fever, and the other as an inflammation. How much there is in such a distinction those only can tell who, regardless of theories, watch the actual condition of patients under either form of disease, and can feel assured, as they certainly may be, of the benefits of depletion and starvation in the one case, of the absolute necessity for supporting and sustaining in the other. The state of the skin and the pulse help us more in this matter than any other set of symptoms; fever is associated with more burning and pungent heat of skin, with greater frequency and less power of pulse from the earliest period of the attack, and is not often associated with perspiration. But though these point the way with reference to treatment, it is by constant and repeated observation alone that we learn in each case how far the type of the disease is of a sthenic character, and are able to determine whether the patient will bear for a little while mère watching and starvation, or his tendency to prostration is such as demands our using from the first every means of support.

Treatment.—Treatment embraces especially two points: 1st, the arrest of the inflammatory action; 2nd, the relief of the breathing. We cannot in this disease very often wait for such a change in the condition of the membrane as shall of itself bring relief to the breathing; the patient may die of suffocation before the inflammation subsides, however energetic our remedies may be. The state of the skin and pulse, and the hurry of the breathing, lead us most naturally to salines and antimony, as the best means of accomplishing this end. If the patient be healthy and robust, a few leeches to the top of the sternum aid in emptying the vessels and checking the exudation. The extent to which these remedies are employed must depend mainly on the constitutional strength of the patient; and in the event of diphtheria prevailing at the time, their employment must be still more sparing, because of the known tendency to depression which accompanies it, and seems to modify very much, for the time being, any coincident cases of sporadic croup. But even without any such complication, the mere fact of severe inflammatory action, with its exhausting and debilitating effects on the constitution, must put us on our guard against allowing the patient to be too much lowered by depletion, and demands a supporting plan of treatment at a comparatively early period when it occurs in the susceptible and rapidly-changing structures of childhood. The intention of this part of treatment is, if possible, to limit the febrile action before such an amount of exudation has been poured out as may run the risk of producing fatal suffocation; we do not hope or expect to arrest it altogether.

Mercury has so long enjoyed a reputation as the most powerful solvent of fibrinous exudations, that it is almost always given in croup; but one decided objection presents itself, that its action is too slow to be very available. If the patient survive long enough to be brought fully under its influence, the probability in favour of recovery is already considerable, and the result ought not to be set down to the mercury in very many cases in which it is given. Its usefulness is perhaps rather to be attributed to its action on the excretory functions.

The difficulty of breathing depends in very great measure on the condition of the larynx, and is to be explained partly by the simple fact of congestion, partly by the presence of false membrane. The depressant remedies will aid in relieving the congestion and preventing the renewal of exudation, but are powerless to remove the false membrane; occasional benefit, however, is obtained by their administration in emetic doses, which, especially with children, seem to clear out the trachea while emptying the stomach. Our chief reliance where prompt relief to the breathing is demanded, and seems an unavoidable necessity, must be in the operation of tracheotomy. It is certainly more adapted to this disease than to diphtheria, in so far as the attack is local instead of constitutional, is an inflammation and not a blood-poisoning. The principal objection to its employment is found in the fact that the false membrane is rarely limited to the trachea, but also partly descends the bronchi; and hence that while sometimes a sufficient amount of air is admitted into the trachea, it cannot reach the lungs, because the bronchial tubes are choked up. English medical men seem now very generally to incline to the opinion that the operation, if not to be recommended, is at least justifiable, as it does not materially increase the risk of a fatal issue, and unquestionably in some cases offers the only chance of recovery; but, to be successful, it must be performed at an early period of the attack. Such a practice is likely to meet with much opposition, from the prejudices of friends, who cannot see that there is any need for its performance; and, out of deference to their wishes, the operation is too often postponed to so late a period that it does little or no good. No operation of course can be undertaken without some risk; but the risk attending tracheotomy must be greatly increased if it is to be done in a hurry, with the immediate prospect of life being terminated by suffocation if the final plunge of the knife into the windpipe be a moment delayed. At the same time the chance of ultimate recovery is very much diminished if the blood has become thoroughly poisoned with unexpired carbonic-acid gas. The stethoscope may do something, but it cannot do much, in determining the question of how far the minute tubes are obstructed. The noise produced in the larynx and trachea generally drowns every other that might be heard; but if crepitation be distinctly audible, indicating that inflammatory action is not limited to the trachea and the large tubes, to undertake the operation of tracheotomy would be quite unjustifiable, except for the purpose of satisfying the urgent desire of patients or friends, who ought to be informed that no countervailing benefit can be looked for to compensate the risk.

A. W. BARCLAY.

DISEASES OF THE LARYNX.

IN Laryngeal Diseases the ordinary symptoms, such as pain, cough, difficulty in breathing and in swallowing, alteration of the voice, &c., often fail to indicate the precise nature and seat of the malady.

Moreover, irritation of or pressure upon the recurrent or other nerves by tumours, aneurisms, &c., as well as certain morbid conditions of the nervous system generally, may give rise to symptoms which more or less closely simulate those produced by actual disease of the larynx itself. Hence it constantly happens that some aid to diagnosis must be obtained, or the treatment adopted is likely to be as unsuccessful in result as it is necessarily uncertain in direction. Such aid is afforded by the Laryngoscope. This instrument was suggested—indeed repeatedly suggested—many years ago, but it has only recently come into general use. Its great value as an aid in the diagnosis and treatment of diseases of the larynx, though fully established, was not yet generally recognised and appreciated when the First Edition of this Work was published.

Historical details relative to the invention of the laryngoscope would be altogether out of place in these pages.[*] It may, however, be stated, that Dr. B. G. Babington appears to have just claims to be considered the first successful laryngoscopist.[†]

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[*] The history of Laryngoscopy is more or less completely discussed in the following works:—*The Use of the Laryngoscope*, by Morell Mackenzie, M.D., 2nd edit. London, 1866. *The Laryngoscope in Diseases of the Throat*, by Sir G. D. Gibb, M.D., 3rd edit., 1868. Art. by Mr. Windsor in the *Med.-Chir. Review*, Jan. 1863. Art. 'Laryngoscope' in the *Dict. encyclop. des Sciences médicales*. Paris, 1868. *Klinik der Krankheiten des Kehlkopfes*. by Dr. Ludwig Türck. Wien, 1866. *Die Laryngoskopie*, by Dr. Bruns. Tubingen, 1865. *Lehrbuch der Laryngoskopie*, by Dr. Tobold. Berlin, 1863. In these works may also be found much valuable information relative to the construction and practical uses of the laryngoscope, as well as to the diagnosis and treatment of Diseases of the Larynx. Constant reference has been made to them in preparing the following pages.

[†] *London Medical Gazette*, vol. iii. p. 555. London, 1829.

Further, it is impossible to omit an expression of grateful acknowedgment of the labours of Professor Czermak, formerly of Pesth.* To him, probably more than to any one else, we are ndebted for the earliest complete demonstration of the general practicability and value of laryngoscopical examinations, and the best methods of making them, and still more, perhaps, for the disinterested and painstaking manner in which, both on the Continent and in this country, he has published his results, and personally taught his method.

LARYNGOSCOPY.

The Laryngoscope essentially consists of the laryngeal speculum together with some contrivance, by means of which a good light can be thrown upon it, when introduced into proper position in the pharynx.

The laryngeal speculum is a small plane mirror, fixed to one extremity of a slender but strong stem of sufficient length. The other extremity of the stem is fitted into a light handle, either permanently, or in such manner that it can be removed or changed at will. The mirror may be of polished steel, speculum metal, or silver; or it may be made of silvered glass (looking-glass) mounted in a thin metal frame. The metallic mirrors are readily warmed, retain their heat well, and are so thin as to occupy but little space. On the other hand the silvered glass mirrors are much less liable to get tarnished or scratched; no practical disadvantage arises from their comparative thickness, and there is no difficulty in keeping them of such temperature as to prevent the deposition of moisture upon them. They are, therefore, as a rule to be preferred.

In shape the mirror may be circular, ovate, elliptical, or quadrilateral with rounded angles. The three first named forms are recommended by Türck,† the last by Czermak.‡ For all ordinary examinations the circular and quadrilateral forms are the best, and they answer equally well. In cases, however, in which it may be necessary to carry the speculum deeply into the pharynx, or in cases in which the tonsils are much enlarged, the ovate or elliptical form is preferable.

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* *Zeitschr. der Ges. der Aertze*, No. 17. *Der Kehlkopfspiegel und seine Verwerthung für Physiologie und Medizin.* Leipzig, 1860. *Du Laryngoscope.* Paris, 1860. A translation of this work was published by the Sydenham Society in 1861. Also many subsequent contributions to Foreign and British Journals.

† *Méthode pratique de Laryngoscopie,* par le docteur Türck. Paris, 1861; and op. cit. p. 38.

‡ *Du Laryngoscope,* par le docteur Czermak. Paris, 1860.

The mirrors ordinarily supplied by the makers vary in diameter from half-an-inch to an inch or more. In every case the larger the mirror that can be employed the better is the general view obtained. The stem should be straight, or only slightly curved, and four or five inches in length. It should form with the diameter of the mirror drawn to its point of junction an angle of from 120° to 125°. Moreover the mirror should be so inclined as to look somewhat downwards when the stem is held horizontally. It is advantageous to have the stem of such material that it may be bent in one direction or the other, so that different degrees of inclination may be given to the mirror according to the requirements of the case under examination.

For the illumination of the speculum when in position either direct or reflected light may be employed. But in either case, if the light should not be very powerful, concentration of the rays is desirable.

Direct sunlight answers perfectly, but is seldom available. Some other source of light *must* frequently, and *may* always be employed. Diffused daylight is rarely, if ever, sufficiently powerful. The light of a lamp concentrated by means of a glass globe filled with water,—both lamp and globe being placed behind the observer, the light coming over his shoulder,—was formerly recommended by Türck.* A somewhat similar but improved arrangement is advocated by Dr. Walker of Peterborough.† But the inconveniences of any such method are obvious. Moura-Bourouillon describes, in his treatise on Laryngoscopy,‡ an instrument which he names the 'Pharyngoscope.' This consists of a large biconvex lens capable of bringing to a short focus the rays of light from a powerful lamp, to the stand of which it is so connected as to be easily adjusted, and moved in various directions. The whole apparatus is placed between the patient and the observer, who looks by one or other side of it. A slight modification of this arrange-t is commonly used in Paris, and is recommended by haber.* The modification consists in the addition of a con- reflector behind the light, and a shade which surrounds amp to such an extent as to protect the eyes of the observer any direct rays. The condensing lens, the reflector, and shade, are all attached to a metal ring, which is capable of g adapted and fixed by screws to almost any lamp.

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* Türck, *Zeitschr. der Ges. der Aertze*, No. 26, 1858.

† *The Laryngoscope and its Clinical Application*, by T. J. Walker, M.D. T. Richards. London.

‡ *Cours complet de Laryngoscopie.* Paris, 1861.

arious other contrivances have been from time to time ted for the direct illumination of the laryngeal speculum. all are open to the objections that in their application the tion of the light is too little under the ready control of surgeon; and too much depends upon the maintenance of patient in proper position. He cannot be examined when mbent. Moreover, the head of the surgeon is apt to ruct the light if its source is behind him; and the lamp be awkwardly in the way if placed in front of him. These other objections are more or less completely avoided by loying reflected light for the illumination of the speculum. mak first suggested the use of a modification of Ruete's ophthalmoscopic reflector for this purpose. And some method as that which he originally suggested still ars the most convenient and most generally applicable. At rate it is the method commonly adopted in this country in Germany.

e source of light is placed on one side of and somewhat nd the head of the patient, who should, if practicable, be ed near the corner of a table. The rays are then reflected and concentrated by a circular concave mirror duly nged immediately in front of the face of the surgeon. The or should be three or four inches in diameter, and should a focal distance of about twelve inches. It may be per- ted or not in the centre. If perforated it may be placed in t of one eye, and the view may be taken through the per- ion. If not perforated it may be arranged in front of the ead and nose, and between the eyes; or lower down in t of the nose and mouth. In either of these arrangements eyes may be used; in the former looking below, in the r above the reflector. The perforated reflector should retically give the more perfect view. But practically the

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See Krishaber in the *Dictionnaire encyclopédique des Sciences médicales.* Laryngoscope.' Paris, 1868.

imperforate reflector is found to be as efficient in all ordinary cases; and it possesses the great advantage of permitting the equal use of both eyes. The reflector may be held in the hand, when the hand is not required for any other purpose; or it may be supported on a stand in such a manner as to be freely movable in all directions. In Tobold's arrangement it is connected with the stem of the lamp, or the light-concentrator. Generally, however, it is attached to the head of the surgeon by means of a strong spectacle frame, an elastic frontal band, or a steel spring passing over the vertex. The first method is best adapted for the perforated reflector; the second for the imperforate reflector in front of the forehead; and the third if the reflector is worn lower down. Czermak's original plan of fixing the stem of the reflector at right angles to a piece of wood to be held between the teeth may be considered obsolete. In any case the reflector should be connected with its support either by a ball and socket joint, or in such other way as permits it to be turned easily in any required direction.

As a source of light, any lamp which burns with a bright, steady, full bodied flame, may be employed. A good moderator or reading lamp, or an Argand gas burner, answers perfectly well for all ordinary purposes. But it is desirable to have the lamp so arranged that it can be raised or lowered in position, and moved from side to side. Mackenzie's 'rack movement laryngoscopic lamp,'* which readily admits of perpendicular and horizontal movement, is admirably adapted for use in the consulting room.

The light of the lamp may be advantageously concentrated by means of one or more lenses placed in front of the flame, and a concave reflector or white reflecting surface placed behind it. Of all the so called 'light-concentrators' which I have seen, I believe Mackenzie's is the best for ordinary use. It consists of a metallic cylinder having a short branch which bears a plano-convex lens two or three inches in diameter. The cylinder replaces the glass chimney of the Argand gas burner; and its branch is so situated, and of such dimensions, that the lens is opposite the middle of the flame, and receives and concentrates a large body of luminous rays. Dr. George Johnson's light-concentrator has the advantages of portability and readiness of application to any ordinary lamp. It consists of a plano-convex lens, and a concave reflector attached to a metal ring, which by means of a spring clip or screw can be easily fixed to the brass collar of the lamp glass. Tobold's apparatus contains two lenses. It is very efficient in working; but it is heavy and cumbersome, and can only be applied to a lamp especially adapted for it.

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* Made by Mayer and Meltzer.

For purposes of demonstration, and sometimes in operating, it is advantageous to have command of a more brilliant light than any ordinary lamp can afford. Such a light may be obtained by means of the electric, magnesium, or oxyhydrogen lantern. Of these the last named, or some modification of it, is most easily available and most manageable. The apparatus employed at the Hospital for Diseases of the Throat answers admirably. The so-called 'Medical Lantern' of Dr. Thudichum,* which he especially recommends for use in rhinoscopy, is equally adapted for laryngoscopical and other examinations. In this apparatus the hydrogen flame is conveniently replaced by that of a spirit lamp.

In cases in which the diagnosis is doubtful, or in the treatment of which difficult operative measures are needful, it is sometimes well to wait until sunlight is available. In making an examination by sunlight, a plane rather than a concave reflector should be used. The latter throws too brilliant a light; and moreover the rays concentrated by it may possibly burn the patient if proper care is not taken.

In all cases in which sunlight, or any other powerful light is employed, the eyes of the surgeon should be protected by a plain shade, or by the hollow conical eye protectors,† which are figured in use in the chapter on RHINOSCOPY (p. 258, fig. 227). If a comparatively feeble light is employed it is advantageous to darken the room in which the examination is made.

The general arrangements for making an ordinary laryngoscopical examination by means of the reflector and artificial light are represented in Fig. 254.

The lamp, the mouth of the patient, and the eyes of the observer should be as nearly as possible in the same plane. If the laryngeal speculum is held in the right hand of the surgeon, the lamp should be placed on the right side of the patient, and

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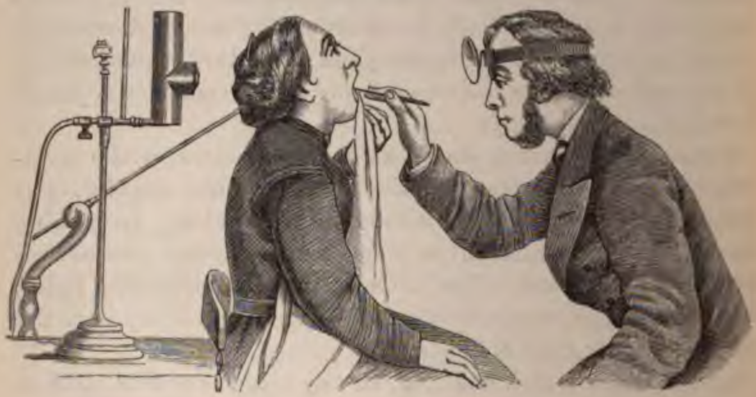
* Made by Orchard of Kensington. See Thudichum *On Polypus of the Nose and Ozæna*, p. 5. Churchill, 1869.

† Made for me by Messrs. Weiss.

vice versâ. If, as may sometimes be convenient, the lamp is placed above and behind the head of the patient, the vertical plane must be preserved; but the speculum may be held with equal advantage in either hand without risk of obstructing the light.

The patient should if possible be comfortably seated opposite the surgeon in a nearly erect position. His body should lean somewhat forwards, and his head should be inclined slightly backwards; but should not be thrown so far back as is often done. Sometimes it is advantageous to employ a 'head rest,' which may either be fixed to the back of the chair, or may have a separate stand. When in proper position, the patient is directed to open his mouth as widely as possible, and to breathe quietly but deeply. His tongue may be protruded, and held by himself or by the surgeon, the fingers and thumb being covered by a soft towel or handkerchief to prevent slipping; or it may be kept within the mouth, and gently pressed forwards against the lower teeth, an attempt being made at the same time to depress and flatten or render concave its posterior part. Sometimes one plan, sometimes the other is found to be the more effectual. Meanwhile the surgeon arranges his reflector so as to throw the light into the open mouth of the patient. When he has succeeded in illuminating the middle of the soft palate, the uvula, and posterior pharyngeal wall by a bright disc of light, he may proceed to introduce the laryngeal speculum.

Fig. 254.



The handle of the speculum should be held somewhat 'pen-like' between the thumb and the fore and middle fingers of one hand or the other. The speculum should be slightly warmed previous to its introduction, either over the lamp or by momentary immersion in hot water, in order to prevent deposition of moisture upon its surface.* Care must be taken, however, that it is not made too hot. Its temperature may be easily tested by the hand or cheek of the surgeon. The speculum should be introduced with its reflecting surface directed downwards and forwards. It should be carried backwards through the cavity of the mouth, deliberately, confidently, and steadily, and then applied with gentle but firm pressure against the uvula and neighbouring portions of the soft palate. Uncertain, hesitating, and hasty movements of the instrument are liable to give rise to objectionable titillation. In its passage through the mouth it should not come in contact with the tongue, nor indeed with any other parts than those against which it is to be placed. As a rule it should not be carried so far back as to touch the posterior pharyngeal wall. Sometimes, however, especially in certain exceptional cases, this may be done with considerable advantage. The hand of the surgeon must be kept somewhat down and well towards its own side, so as not to obstruct the light. The third and fourth fingers may rest against the chin or cheek of the patient. The stem of the instrument should lie in or near to the corresponding angle of the mouth. In a large proportion of cases no difficulty is encountered, and the patient suffers comparatively little inconvenience.

When the speculum is thus placed in position and well illuminated, it exhibits to the surgeon images of those parts of the larynx upon which the rays reflected from its surface are made to fall. It must be borne in mind, however, that as a necessary consequence of the position of the mirror in relation to the eye of the observer on the one hand, and to the larynx of the patient on the other, the parts appear in the image as though reversed antero-posteriorly. And they are thus conventionally represented in all ordinary laryngoscopic diagrams.

This so called 'reversal' or 'inversion' of the image is illustrated by Fig. 255, in which B diagrammatically represents the parts as seen when simply looked down upon, and A the same parts as they appear reflected in the mirror. No practical difficulty or inconvenience results from this apparent inversion.

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* Various expedients have been suggested with a similar view. Thus, Dr. H. G. Wright contrived a speculum, the temperature of which was maintained by a wire placed behind the mirror and heated by galvanic action. Dr. Buzzard recommends that the surface of the mirror should be covered with a film of glycerine. But no plan answers better than the simple one above-mentioned; nor is any other so easy of application.

FIG. 255.

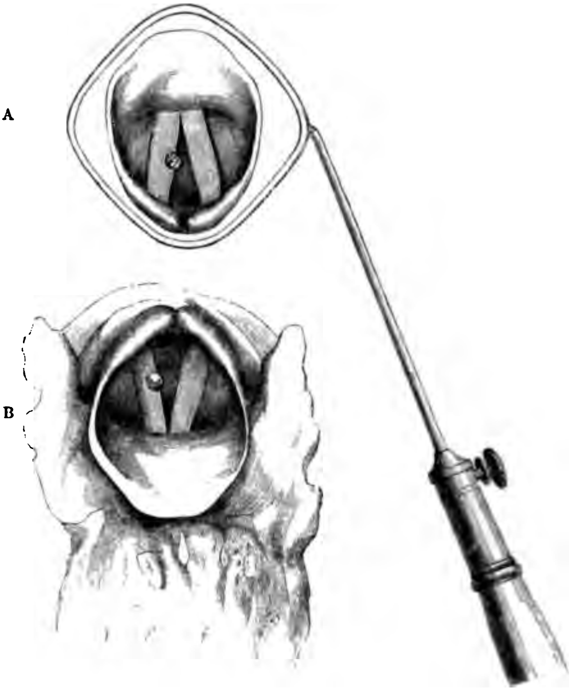

Diagram illustrating the antero-posterior reversal of the Laryngoscopic image. The small excrescence situated on the right vocal cord (B) might be falsely supposed to be on the left from the appearance presented in the mirror (A).

By varying the inclination of the mirror, and slightly changing its position from time to time, the following parts, or rather certain portions of them, may be successively brought into view; the base of the tongue and glosso-epiglottidean ligaments; the epiglottis and aryteno-epiglottidean ligaments; the cartilages of Santorini, and the arytenoid cartilages; the true and false vocal cords; the ventricles and anterior wall of the larynx; more or less of the anterior wall of the trachea; and if the glottis is very widely open and the light very good, even the bifurcation of the trachea, and a small portion of the right bronchus. These several parts, however, cannot all be seen with equal facility. Numerous rules have been laid down as to the

ition and degree of inclination of the mirror best adapted
the special examination of each particular part.* But it is
dless to repeat them. A correct knowledge of the relative
itions and natural appearances of the parts, and a considera-
n of the simplest laws of catoptrics, together with a certain
ount of practical experience, will enable the laryngoscopist
bring into view and recognise one part after another so far
may be practicable. Repeated attempts are often necessary
ore even partial success can be attained. And sometimes
n the utmost perseverance only results in failure. But this
ed rarely happen. The possible sources of difficulty are
merous, and the actual difficulties may be great; but they
y generally be obviated or overcome, at any rate to some
tent, by patience and judicious management. Those who
ffer from chronic laryngeal affections are as a rule the best
bjects for laryngoscopic examination—not the worst as might
supposed. Their desire for benefit affords a stronger stimu-
s to patience and self-control than can actuate the healthy;
d, moreover, they are usually already accustomed to expose
eir fauces for inspection, and to submit to local applications,
which indeed the normal sensitiveness of the parts may have
en diminished.

The most common sources of difficulty are as follows: general
rvousness and excitability of the patient; fancied or real in-
ility on his part to open his mouth sufficiently widely, and
kwardness in the management of his tongue; relative large-
ss, or some swollen condition of the tongue; malformation or
formity of the soft palate and neighbouring parts from ulcera-
e disease, and subsequent contraction of cicatrices; elonga-
n and thickening of the uvula; enlargement of the tonsils;
ndency of the epiglottis; and, lastly, extreme sensitiveness of
uvula and soft palate, either natural or resulting from
isting inflammation or ulceration.

Difficulties arising from the first three sources may be over-
ne almost invariably by patience and judicious management
the part of the surgeon, and a little practice on the part of
patient. Hastiness in manner, and in method of proceed-
should be avoided; and every effort should be made to en-
rage, reassure, and inspire confidence. By his own example

Krishaber, Art. 'Laryngoscope' in *Dict. encyclop.* Op. cit. p. 497 et seq.
k. Op. cit. and *Méthode pratique de Laryngoscopie.* Paris, 1861.

the surgeon should show the patient how to open his mouth, and should demonstrate the slightness of the inconvenience caused by the introduction of the speculum. If proper directions are given, and the patient is induced to practise occasionally by himself before the looking-glass, he will probably return in the course of a few days comparatively well able to display his fauces, and to submit to the needful examination.

By one or other of the methods already indicated (p. 520) the tongue may generally be kept out of the way. If, however, these methods fail, and the tongue still rises so high as to obstruct the view of the soft palate, &c., the patient should be directed to make a few deep inspirations, and alternate them with the repeated pronunciation of the broad vowel '*a*' (ah). He should breathe through the mouth only; not through the nose. In this way the tongue may often be brought into favourable position. Sometimes a broad spatula or tongue depressor may be advantageously used. But as a general rule the introduction of any unnecessary instrument into the mouth should be avoided.

Occasionally by sliding the finger along the tongue (the speculum being at the same time introduced and illuminated), an effort at vomiting is produced, during which the tongue being depressed and the larynx raised, a good though a momentary view may be obtained.

In cases in which *the soft palate is unusually short, and the uvula small and thin*, the speculum is apt to slip up somewhat behind them, and to become partially hidden. Under such circumstances it is better to hold the instrument as nearly as possible in its proper position without touching or resting against the soft palate.

An elongated and thickened uvula may obscure the view by hanging below, and turning round the inferior border of the speculum. The employment of a larger speculum, or a little manœuvring of the instrument serves to obviate this source of difficulty for the time being; and it may be permanently removed by appropriate measures.

Considerable embarrassment is often caused by *chronic enlargement of the tonsils*. In such cases a narrow, elongated, elliptical speculum should be used, and carried somewhat more deeply into the pharynx than is usually necessary. Enlarged tonsils are often so little sensitive that the speculum may be pushed well in between them without causing much discomfort.

Pendency or projection backwards of the epiglottis is a fre- ent source of considerable difficulty. Gibb states as the sult of his observations that some such abnormal condition is be found in eleven per cent. of otherwise healthy individuals.* depends upon undue elongation of the glosso-epiglottidean aments or folds of mucous membrane, together with relaxa- n or weakness of the muscular fibres they contain. The gree of obliquity observed varies greatly in different cases, d to some extent in the same case under different conditions. some instances the epiglottis hangs almost horizontally over e entrance to the larynx; but more frequently its deviation om the normal erect position is comparatively slight, or even ly occasional. Laryngoscopic inspection is of necessity pro- rtionately impeded. The greatest difficulty is often experienced obtaining a satisfactory view, and sometimes even partial ccess appears to be impossible.

In all cases of pendent epiglottis it is necessary to carry the eculum further backwards and downwards, and to make its flecting surface look more forwards than is desirable in the ormal condition of parts. Sometimes its lower border must be laced against the posterior wall of the pharynx. When the peculum is in position, the patient should be directed to utter series of short, high, *staccato* notes, or to imitate a shrill *alsetto* laugh. During the emission of such sounds the piglottis is suddenly raised, and jerked forwards. Opportunity nay be thus afforded for a succession of brief glimpses of the nterior of the larynx, which may suffice at any rate to deter- nine the diagnosis. Another method which sometimes proves partially successful is as follows. The head of the patient is thrown back as far as possible, and his tongue is projected and held by himself. The speculum is introduced and inclined slightly backwards and downwards, and the surgeon having lowered his head looks into it as it were from below upwards. At the ame time with his free hand he presses the pomum Adami of he patient backwards and somewhat upwards.† There can be o doubt that the larynx may often be moved into comparatively avourable position for inspection by external manipulation; ut the method is liable to occasion much discomfort, and ometimes considerable pain.

In some instances in spite of all attempts the epiglottis still persistently hides the larynx from view. And in such cases it may be desirable to raise it mechanically by instrumental aid. Forceps, tenaculums, and hooked sounds of various kinds have been devised for this purpose by Bruns,* Voltolini, Fournié, Lewin, Mackenzie and others. But all such instruments are difficult for the surgeon to use, and still more difficult for the patient to tolerate. It is only in very exceptional cases that they can be employed with advantage. The epiglottis is extremely sensitive; but it bears firm pressure and a steady but gentle pull better than the uncertain titillation of a hesitating touch. If any attempt at seizure be made, the instrument should be carefully warmed previous to introduction.

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* Op. cit. p. 44.

† See Krishaber. Op. cit. p. 493.

Difficulties arising from unusual sensitiveness of the uvula and soft palate may generally be overcome by patience and dexterity on the part of the surgeon, and a little practice on the part of the patient. During the earlier attempts the speculum should not be maintained too long in contact with the parts. It should be at once withdrawn if decided retching is produced; and short of such effect, if the irritability is great, it is better to apply the speculum repeatedly for a moment or two, and remove it as often, without caring to obtain any view until the parts have become as it were accustomed to the presence of the instrument. When once efforts at vomiting have been excited, there is little probability of success until a future occasion. Preparatory measures of various kinds have been from time to time suggested; some of these are probably useful; others have been proved by experience to be altogether useless. Many owe their accredited efficacy to the confidence with which their exhibition has inspired the patient. The internal administration of bromide of ammonium or bromide of potassium in full doses has been strongly recommended and extensively tried, but with variable results. Gargles containing bromide of ammonium are said by Gibb to produce 'moderate anæsthesia' of the fauces in twenty-four hours.† Türck reports favorably of the repeated application to the fauces of a mixture (recommended by Bernatzik) which consists of three grains of hydrochlorate of morphia, one drachm of alcohol, and half an ounce of chloroform.* But all such applications as this would appear more likely to inflame than to soothe the sensitive parts. Alum gargles, or solutions of alum or some other astringent in the form of spray are often useful. Occasionally a few whiffs of chloroform may be advantageously inhaled. But by far the best and easiest plan, so far as I know, is to direct the patient to suck a little ice immediately before submitting his throat for examination. The result is generally satisfactory.

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* Bruns appears to have been the first to have used an instrument of this kind; and he did so in the case of his own brother who suffered from a polypoid growth in the larynx. The epiglottis was elevated by means of a pair of flat-bladed forceps, and the growth was successfully removed. See *Die erste Ausrottung eines Polypen in der Kehlkopfshohle.* Dr. Bruns. Tubingen, 1862. Also *Die Laryngoskopie.* Dr. Bruns. Tubingen, 1865, p. 257.

† *The Laryngoscope in Throat Diseases.* Op. cit. p. 46.

Besides the various sources of difficulty thus discussed, there are others which depend upon inexperience and want of dexterity on the part of the surgeon. These can only be obviated by careful practice. The surgeon should not only familiarize himself with the management of the laryngoscope, but also with the relations and appearances presented by the healthy living parts when viewed by its aid. In colour especially, the mucous membrane of the larynx seen during life in the laryngeal mirror looks very different to what it does when examined after death on the *post mortem* table. It is very possible for the tyro in laryngoscopy to mistake the natural tint of some parts for a certain degree of inflammatory redness.

The general appearances and relations of parts as seen in the laryngeal speculum need no special description. They may be learnt by the careful study of a larynx removed from the body, or by *auto-laryngoscopy*, or by the examination of the larynx of some living subject. But with regard to the colour presented by the different parts in a state of health, the following observations may be made.

The lingual surface of the epiglottis appears of a yellowish or pinkish drab colour. Its upper border is decidedly yellow. Its laryngeal surface, especially the 'cushion,' varies from a pinkish yellow to a deep pink; sometimes it appears bright red—so bright, indeed, as to suggest the idea of the existence of an inflammatory condition. The aryteno-epiglottidean folds are pale pink. Stoërk accurately describes them as being about the same colour as the gums. The mucous membrane covering the arytenoid cartilages is still pink, but of a somewhat deeper tint. The false vocal cords are perhaps slightly deeper pink still. The true vocal cords are distinguished by their glistening pearly whiteness; but sometimes they are slightly greyish. The cricoid cartilage is recognised by its well marked yellowness. The tracheal cartilages appear of a yellowish drab colour; and between them the mucous membrane is pale pink.

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* *Allgem. Wiener Med. Zeit.*, p. 98. 1863.

A great variety of different instruments have been devised from time to time for the several purposes of demonstrating to others the appearances of the larynx under examination; of holding the laryngeal mirror in a position so as to leave both hands of the surgeon free; and of depressing the tongue at the same time the laryngeal mirror is introduced. Some of these are useful; others are rendered unnecessary by the aid of a skilful assistant. For descriptions of all such contrivances reference may be made to the special treatises already quoted.

GENERAL REMARKS ON THE TREATMENT OF DISEASES OF THE LARYNX.

The laryngoscope affords most valuable aid, not only in the diagnosis, but also in the treatment of the various diseases of the larynx. Guided by the view obtained, the surgeon is enabled to make such local applications as may seem desirable, with accuracy and precision, and to perform many different operations—such as scarifying the mucous membrane, opening abscesses, removing growths, &c., with certainty and safety. The use of the laryngoscope has altogether set at rest the doubts formerly entertained as to the practicability of introducing brushes, probangs, and other instruments into the larynx.* Such doubts have in past time unquestionably prevented the adoption of methods of treatment, that, in many cases, might have been eminently successful. But now-a-days it would appear that the danger is in the opposite direction, and that the tendency is rather to carry out local treatment too vigorously, or to rely upon it too exclusively.

Remedial applications may be made to particular parts, or to the whole of the interior of the larynx with variable advantage by several different methods. It appears desirable to give at once a general description of such methods, and to refer in the succeeding sections to the special modifications requisite in the treatment of each particular malady.

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* See Former Edition of this Work, vol. iii. pp. 246 and 247, note.

Solid substances may be applied either in the mass or in powder. If applied in the mass, some form of caustic holder is requisite. No instrument answers so well, and at the same time is so safe, as a piece of moderately thick aluminium or silver wire mounted in a slender handle, and hollowed into a tiny cup, or roughened at the extremity. The roughened extremity may be dipped into various substances, as nitrate of silver, chloride of zinc, &c., while in a state of fusion; and a sufficient quantity may be taken up in a bead-like form, or as a thin coating. The wire may be easily bent at any angle requisite, and there is no danger of any considerable portion of the substance breaking off and falling upon parts it was not intended to reach. Such danger might arise during the use of some of the various complicated caustic holders that have been devised for similar purposes. By aid of the laryngoscope a small caustic bead, prepared in the manner described, may be definitely applied to any particular point; or if the wire is coated to a sufficient extent, the general surface may be wiped over.

Powders can only be applied to the mucous membrane generally. They may be inhaled through a tube, as recommended by Fournié, or, far better, blown in by means of Rauchfuss's insufflator * or some modification of it. The insufflator, duly charged, is introduced into the back of the fauces, with the extremity turned down towards the larynx. The patient is then directed to make a slow steady inspiration, and while he is doing so the india-rubber ball of the insufflator is suddenly compressed. Under such circumstances it is obvious that a considerable portion of the powder must be diffused over the mucous membrane of the larynx. The powders that have been used with most advantage in this manner are tannic acid, alum, acetate of lead, sulphate of zinc, sulphate of iron, calomel, and in some exceptional instances, nitrate of silver. It is scarcely needful to add that in every case the substance used should be very finely pulverised. Sometimes it may be advantageously diluted with two or three or more parts of sugar of milk.†

Liquids, or substances in solution may either be applied by

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* This instrument is figured in the Essay on DISEASES OF THE NOSE, p. 278.

† Studley, *American Medical Times*, March 2, 1861.

means of a full-bellied camel's hair brush, or small sponge, mounted on a properly curved aluminium or silver wire or whalebone stem; or they may be injected in a fine shower from Gibb's 'laryngeal syringe' or 'hand atomiser';[*] or they may be inhaled in the form of 'spray,' produced by one or other of the various instruments devised for the purpose. Strong solutions, especially those of a more or less caustic nature, should, as a rule, be applied by the brush. Among the more generally useful of such solutions may be enumerated those of nitrate of silver (℈ij. or ʒij. to ℥j. of distilled water), perchloride of iron (ʒij. or more of the tincture to ℥j.), pure carbolic acid (ʒss. or more to ℥j.), alum (a saturated or weaker solution), sulphate of copper (a saturated or weaker solution), &c. Glycerine or honey may be advantageously mixed with these solutions in considerable proportion, in order to give them viscidity, and render them more adhesive. Iodine (gr. xx.), iodide of potassium (gr. v.), and olive oil (℥j.), form an application recommended by Dr. Marcet.[†] The 'glycerinum acidi tannici' (B. P.) may also be used in some cases. By means of the brush all such substances may be applied with a certain degree of precision to any particular part. In some instances even nitric acid, chromic acid, and other powerful escharotics have been thus applied to ulcers, warty growths, &c., with safety and advantage. At the moment the brush is to be introduced into the larynx, the patient should be directed to make a full deep inspiration in order to dilate the aperture as widely as possible. In cases in which the epiglottis is pendent, it is often very difficult to get the brush beyond it into the larynx. Under such circumstances the laryngeal syringe may be more successfully used, inasmuch as its extremity may be guided round, and made to raise the pendent valve to a sufficient extent.

The inhalation of 'atomised fluids,' or spray, in the treatment of diseases of the air passages, though suggested long previously, was first shown to be generally practicable by Sales-Giron in the year 1858.[‡] Since then the great value of this method has been fully established, and various improvements have been from time to time effected in the apparatus employed.* The 'spray-producers' at present in ordinary use, consist of two tubes (Bergson's tubes) fixed at right angles to one another; of these, one, placed horizontally, is connected at its distal extremity with some apparatus by means of which a strong current of air or steam can be continuously projected through it; and the other, placed vertically, dips into a bottle or other small vessel containing the medicated fluid. The proximal extremity of each tube is terminated by a very fine orifice; and the orifice of the former tube is immediately over that of the latter. When a current of air or steam is made to rush forcibly from the orifice of the one tube over that of the other, it causes the medicated fluid to rise, and breaks it up as it issues, and diffuses it in an exquisitely fine spray. In Dr. Andrew Clark's well-known instrument (as well as in the various modifications of it adopted by different makers), air is employed, and the current

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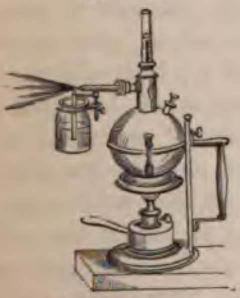
[*] See *The Laryngoscope in Diseases of the Throat*, by Sir G. D. Gibb, M.D., op. cit. p. 92.

[†] *On Diseases of the Larynx*, by W. Marcet, M.D., p. 18. 1869.

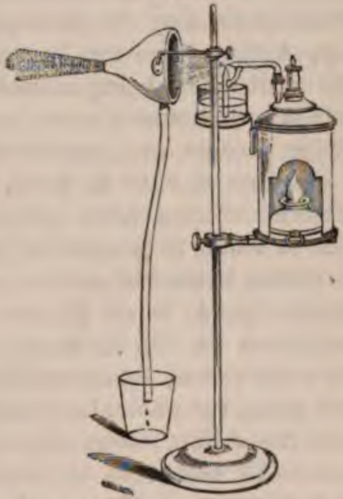
[‡] See the elaborate Report by Poggiale read before the Académie de Médecine, Paris, January 7, 1863, and the discussion thereon. Also Dr. Beigel's treatise *On Inhalation*, London, 1866, in which are full details as to the history of this method of treatment, and descriptions of the different forms of apparatus devised.

FIG. 256.



Simple form of Siegle's steam spray-producer.

FIG. 257.



Siegle's steam spray-producer on stand, with Beigel's face-screen attached.

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* Mackenzie especially recommends Mayer's modification of Matthieu's apparatus, which is worked by means of a pressure-pump: and acts on a different principle to that described above. The fluid is forced through a fine orifice and projected against the interior of a vulcanite 'drum.' It thus becomes broken up into a fine spray. Op. cit. p. 90.

is kept up by means of an india-rubber 'handball' bellows. All such instruments, however, though unquestionably useful, are far inferior, for several obvious reasons, to those in which a jet of steam is employed, as first suggested by Dr. Siegle of Stuttgart. The steam is derived from water contained in a small boiler heated by a spirit-lamp. Figs. 256 and 257 represent two very efficient modifications of Dr. Siegle's original pattern.*

The use of this instrument involves no continuous exertion like the handball spray-producers: and what is of far more importance, the atomised fluid is mixed with and propelled by a current of warm steam instead of cold air. A great variety of different solutions, the strength being varied according to circumstances, may be advantageously inhaled in the form of spray. Among them may be especially mentioned the following —the medicament being in each case in about the proportions specified to an ounce of water:—Alum (gr. x. to gr. xx.), tannic acid (gr. j. to gr. xx.), perchloride of iron (gr. ⅛ to gr. ij., or of the tincture ♏ x. to ♏ xxv.), as 'astringents;' common salt or chloride of ammonium (gr. x. to gr. xxx.), chlorate of potash, borax, or iodide of potassium (gr. iij. to gr. x.), as 'alteratives;' and watery extract of opium (gr. ¼ to gr. ½), hydrochlorate of morphia (gr. ⅛ to gr. ⅓), or fluid extract of hemlock or hyoscyamus (♏ iij. to ♏ x.), as 'sedatives' or 'anodynes.' Very weak watery solutions of iodine, and chlorine (or chlorinated soda), tar water, lime water, weak alkaline solutions, sea water, the saline waters of many mineral springs,† and other solutions too numerous to mention have also been largely used in different cases with variable advantage. Sulphurous acid in spray has recently been very strongly recommended in the treatment of various affections of the throat and larynx by Dr. Dewar and others. But experience seems to show that great caution is requisite in the use of this material. Though doubtless beneficial in some cases, in many it has proved not only less efficacious, but far more mischievous than was anticipated. Solutions of nitrate of silver and other powerful metallic salts are unsuitable for application by means of the spray-producer.

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* These as well as other forms of this apparatus are made by Messrs. Krohne and Sesemann.

† 'In 1849 Auphan, of Euzet-les-Bains, originated the idea of atomising the mineral water by throwing a jet of the liquid against the wall of the inhalatory. After a short time the same system was adopted in Lamote-les-Bains. But Sales-Giron first constructed at Pierrefonds an apparatus through which the fluid was subdivided into a fine mist, which was inhaled by the patients with great benefit.'—Beigel. Op. cit. p. 6. At many of the Continental Spas arrangements are now made for the inhalation of the 'atomised' waters.

Many substances may be inhaled with very great advantage in the form of vapour or gas. In various acute or subacute affections nothing is more soothing and beneficial than the almost constant inhalation of warm steam, either plain or charged with some narcotic or anodyne element. The 'hemlock inhalation' of the British Pharmacopœia is very useful; it is rendered less disagreeable and perhaps more efficacious by the addition of a pinch or two of fresh dried hops; or the hops may be infused alone in the hot water; or a portion of opium may be added; in some cases vinegar is useful and pleasant. In chronic cases, according to their nature, the vapour of turpentine, or some aromatic terebinthinate, or iodine, or calomel may be inhaled with very great benefit. For the inhalation of steam, plain or medicated, various so-called 'inhalers' have been devised. Among those ordinarily used may be mentioned Nelson's, Maw's 'double-valved inhaler,' Mudge's, and Beigel's made by Robbins. The two first named are furnished with pieces of sponge which are intended to be imbued with the medicament to be used; but practically it is far better to remove the sponges and to mix the medicament with the hot water. The two last inhalers involve somewhat more respiratory exertion on the part of the patient. But they have the advantage of acting on the 'hookah' principle; the air to be inspired passes through the fluid, and thus becomes thoroughly warmed and charged with vapour. But by far the most perfect inhaler yet devised is that made by Messrs. Maw under the direction of Dr. Mackenzie, and by him termed 'the Eclectic Inhaler.' The advantages of this apparatus are so obvious that it will probably to a great extent supersede those hitherto in use. Bird's inhaling pipe is worthy of mention, as likely to prove very useful for the exhibition of certain vapours, &c.*

Scarification of the mucous membrane of the larynx may be practised with considerable advantage in many cases. The instruments requisite and the method of operating have been already described in the Second Volume of this Work (p. 470). In all cases, if practicable, the instrument (which must be very sharp) should be guided by aid of the laryngoscope. Mackenzie's laryngeal lancet answers the purpose admirably; but it is somewhat complicated, and is not so likely to be at hand as the simple instruments recommended. Numerous punctures or short cuts may be made, if requisite, in different parts. There is very rarely much bleeding, and never, so far as I know, any more than is actually beneficial.

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* Made by Maw. See *Med. Times and Gaz.* vol. i., 1869, p. 672.

The direct galvanisation of the vocal cords is strongly recommended in many nervo-muscular affections of the larynx. The most efficient apparatus for this purpose is the laryngeal galvaniser of Mackenzie. One pole of the battery is connected with a properly curved metal wire terminated by a small wetted sponge which is placed in contact with the mucous membrane of the larynx. The other pole is connected with a handle bearing a sponge which is applied to the front of the neck. When the two parts of the instrument are in position, the circuit is completed by pressing upon a small trigger on the handle of the laryngeal portion of the galvaniser. The galvaniser may be applied several times at the same sitting, it being kept in for a few seconds each time.* Other instruments have been devised with similar intent, but the one described appears to have found most favour with practical laryngoscopists. It is recommended by George Johnson, Smyly, Fauvet, Tobold, Marcet, Gibb, and others.

CATARRHAL LARYNGITIS.

Acute Catarrhal Laryngitis is a formidable, and not very rare affection. It varies greatly in intensity, and consequently in the degree of danger to which it gives rise. It may occur at almost any period of life, but is most frequently met with in adults of plethoric habit.

Exposure to cold and damp, especially after prolonged exertion of the voice, and when the general powers are reduced by fatigue, is the most common cause.

As a rule the fauces are first affected, and the inflammation spreads with variable rapidity to the larynx. Sometimes, however, the malady commences in the larynx itself, and is confined to it.

The earliest *symptoms* are those of an ordinary 'sore throat.'

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* See Mackenzie. Op. cit. p. 96.

The patient complains of dryness, soreness, and a sense of constriction about the upper part of the throat, together with tenderness on pressure over the larynx, and pain and difficulty in swallowing. The feeling of discomfort is constantly referred to the pomum Adami, or its immediate neighbourhood. Respiration soon becomes impeded; the patient experiences a sense of oppression, and from time to time feels it needful to make an effort to breathe deeply. His voice becomes thick and husky; and occasionally he tries as it were 'to clear his throat' by a dry, harsh, or half suppressed and painful cough. Accompanying these symptoms there is more or less general febrile disturbance.

As the malady advances, the symptoms increase in severity; and the patient becomes restless and anxious. The face is flushed, the skin hot and dry, the pulse hard and quick. Respiration becomes more and more seriously impeded. Inspiration is difficult, protracted, and painful, and is accompanied by a wheezing, whistling, or harsh throttling sound. The chest is not fully expanded; and there is diminution of the respiratory murmur. Expiration remains comparatively easy; for the warm, moist air from the lungs irritates the inflamed and sensitive mucous membrane much less than the colder, drier air, inspired from without. The dyspnœa is constant in so far as it depends upon constriction of the glottis from swelling of the mucous membrane; but it becomes greatly aggravated at intervals in consequence of spasmodic action of the muscles. The voice, at first husky and hoarse, soon becomes low in tone, or 'cracked' and uncertain, and finally is altogether lost, the patient speaking only in a whisper. In some cases there is but little cough. In others the cough is frequent, and harsh, husky, or stridulous in character. Cough may be provoked either during inspiration by the contact of cold dry air, or during expiration by the presence of little masses of secretion. The sputa in the earliest stages are very scanty, and consist of little more than saliva; later they become somewhat more abundant, but are still semitranslucent, though more or less tenacious and viscid, containing laryngeal mucus as well as saliva; still later they are opaque and greyish, and sometimes are slightly streaked with blood. After any of these have been coughed up a painful sense of rawness about the part is often experienced. The small, firm, agglutinated masses which are occasionally coughed up, probably come, according to Krishaber, from the ventricles of

Morgagni. The difficulty of swallowing, almost invariably noticed as one of the earliest symptoms, becomes more and more pronounced as the malady progresses. '*Difficulty of deglutition* for which no adequate cause is visible in the fauces,' speedily followed by '*difficulty of breathing* for which no adequate cause can be discovered in the thorax,' are, in the words of Sir Thomas Watson, 'among the earliest of the symptoms that bespeak danger, and ought to excite alarm.'*

If the malady advances to the next stage, and no relief is afforded, the general distress of the patient becomes intense. He labours and struggles for breath. His anxiety and restlessness are extreme. He cannot lie down; or if, exhausted, he tries to do so, he soon starts up involuntarily, gasping for very life. His countenance becomes pale and livid, or even ghastly; his eyes protrude; sweat pours from his forehead; his skin is cold and clammy; his pulse becomes weak and intermittent; exhaustion, drowsiness, and perhaps delirium supervene; and lastly, he dies suffocated—either almost suddenly from spasm of the larynx, or by a process of comparatively slow asphyxiation.

The morbid changes which give rise to the symptoms thus described may be traced during life by aid of the laryngoscope, or made out after death on post mortem examination.

On *laryngoscopical inspection* the mucous membrane of the larynx is seen to be of an unnatural scarlet red colour, and more or less thickened or swollen. Occasionally superficial erosions may be recognised here and there; but neither deep nor extensive ulceration is observed, or only extremely rarely. The redness and swelling, as a rule, are especially manifest in those parts in which the mucous membrane is thick, and is supported by abundant loose submucous areolar tissue. Thus the aryteno-epiglottidean folds, the mucous membrane of the vestibule, the false vocal cords, and the laryngeal aspect of the epiglottis present these appearances in the most marked degree; and generally speaking, they are affected in extent in the order in which they are named. The mucous membrane of the true vocal cords, on the other hand, being comparatively thin, and closely connected with dense subjacent tissues, is less swollen, and less uniformly reddened. Sometimes it is marked by red striæ or patches. Sometimes it seems only to have lost its pearly whiteness, and to have become dull, clouded, or pinkish in colour, and somewhat unduly protuberant. But, as may readily be understood, in many cases the true vocal cords are almost or entirely concealed from view by the swollen parts above. Still more is this the case with the parts of the larynx below the glottis and the trachea, which, nevertheless, not infrequently suffer from extension of the inflammation. The epiglottis is usually seen to be erect, rigid, and swollen. It is consequently unfitted to fulfil its natural valvular office. Sometimes it may be felt by the finger as a smooth, rounded, 'cherry-like' intumescence. Occasionally it gives rise to sensations similar to those produced by the presence of a foreign body. The patient 'feels as though he had something in his throat.'

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* *Lectures on the Principles and Practice of Medicine.* 4th edit. Vol. i. p. 831.

The condition of the epiglottis serves in great measure to explain the difficulty in swallowing, and the sense of suffocation often experienced when the attempt is made. The dysphagia is still further accounted for by the pain caused by the necessary movement of the inflamed and unduly sensitive parts.

The swollen condition of the mucous membrane and consequent constriction of the glottis manifestly give rise to the constant difficulty of breathing; and the temporary paroxysms of extreme dyspnœa are caused by muscular spasm incidentally or accidentally excited.

Post mortem examination shows that the swelling depends upon an injected, infiltrated, and œdematous condition of the mucous membrane and submucous tissue. The redness of the parts observed during life is often partially or wholly lost—inasmuch as the mucous membrane shares in the general pallor of death. Soft, semipurulent, or viscous exudation is usually found covering to some extent the membrane. In some cases the trachea and bronchi are also affected; and the lungs are congested, or even pneumonic.

The *diagnosis* of acute catarrhal laryngitis is not difficult. It may be distinguished from croup and diphtheria by the absence of the false membranes and fibrinous exudations which characterise these maladies; and from croup especially by the difficulty in swallowing, and the early alteration or extinction of the voice. In croup swallowing is usually easy; the voice is often but little affected; the breathing is 'stridulous,' and the cough has a peculiar ringing 'brassy' sound.*

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* See the Article on CROUP AND DIPHTHERIA.

Laryngitis may be distinguished from the first effects of a foreign body in the air passages by the sudden severity with which in the latter case the dyspnœa comes on, the periods of intermission which occur, and the absence of premonitory febrile disturbance. The difficulty of breathing caused by the presence of a foreign body is usually most marked during expiration. The reverse is the case in laryngitis.*

In cynanche tonsillaris respiration is often obstructed. But the cause of obstruction is at once manifest on inspecting the fauces. In laryngitis, on the other hand, the amount of swelling in the upper part of the throat (if even any exists) is altogether insufficient to account for the extreme difficulty of breathing and swallowing, and the alteration or extinction of the voice. It must be borne in mind, however, that laryngitis, or at any rate œdema of the larynx, may coexist with inflammation of the tonsils and mucous membrane of the fauces and pharynx.

In simple pharyngitis there is little or no dyspnœa; but swallowing is painful and difficult, and pain is felt when the larynx is pressed backwards.

The *course* of acute catarrhal laryngitis is usually rapid. Its duration depends upon the intensity of the inflammation, the constitution of the patient, and the nature and efficacy of the treatment adopted. If unchecked it often proves fatal on the fourth or fifth day, and sometimes much more speedily. The celebrated General Washington died of this disease within twenty-four hours. Sir Thomas Watson alludes to an instance in which a fatal result ensued in twelve hours.†

Mr. Gray mentions the case of a man who was 'admitted into St. George's Hospital complaining merely of sore throat. He walked into the hospital, and seemed in such good health that he would not have been admitted, but for the circumstance of his having come some distance from the country. About three hours after his admission, the house surgeon was summoned in all haste to see him, as he was said to be dying of suffocation. He went immediately, but found the patient quite dead. Post mortem examination revealed all the evidences of laryngitis, supervening apparently upon inflammation of the pharynx; but it was especially remarked, that the chink of the glottis was not much narrowed from œdema. In this case there can be no doubt that death was produced by spasmodic contraction of the muscles of the glottis.‡

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* See chapter on 'Foreign Bodies in the Air Passages.' Vol. ii. p. 480.

† Op. cit. Vol. i. p. 833.

‡ See Former Edition of this Work. Vol. iii. p. 226.

In some instances, however, the malady runs a less rapid course, and the patient survives until the eighth or ninth day. In others, and these happily not a few, the inflammation subsides either spontaneously, or as the result of treatment. In such case the effects may disappear almost altogether with comparative rapidity, or the malady may assume a chronic form.

Treatment.—The treatment requisite depends upon the severity of the malady, and the stage it may have reached. Measures which are urgently demanded in some cases are in others unnecessary, and even dangerous. And the mode of treatment that might be most efficacious at the onset of the malady, if adopted too late, may only hasten the fatal termination.

In the earlier stages, and in cases in which the symptoms are comparatively mild, perfect quiet in a warm moist atmosphere, soothing inhalations either of simple or medicated steam or spray, and the administration of salines, with perhaps antimonials and tincture of aconite or some sedative, according to circumstances, constitute the treatment requisite. But in all cases careful watching is necessary; for dangerous symptoms may supervene at any time, and even almost suddenly.

In the more severe forms of the malady, similar but more energetic measures must be rigorously enforced. Soothing inhalations may still be advantageously employed, but their use must be more constant. Antimony and tincture of aconite in small but frequently repeated doses should be administered, especially in cases in which there is much general inflammatory fever.[*] Free mercurialisation has been strongly advocated, but its efficacy appears doubtful; and much precious time may be lost before the system can be affected. General bloodletting, so highly lauded in past times in the treatment of this disease, may be resorted to in the earlier stages. But satisfactory evidence in favour of this proceeding is altogether wanting. Sir Thomas Watson says:—

> 'When there is high inflammatory fever present, and the skin is hot, and the pulse firm and full, and the cheeks red, and the lips florid, you may bleed your patient with decision and advantage. But if his powers are beginning to sink

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[*] The following formula may be recommended:—Vin. antim. tart. ♏ ij. to ♏ iij., tinct. aconiti ♏ j. to ♏ ij., liq. ammon. acetat. ʒss.; to be taken in water or camphor julep every quarter of an hour or every half-hour, until some obvious effect on the circulation, &c. is produced, and then to be continued less frequently.

under the poisonous influence of imperfectly aërated blood, if his skin be cold or even cool, his face pale or leaden, his lips blue, his pulse small and feeble, his mind wavering, you will do no good by blood letting; nay, you will increase the debility which already exists, and hasten the fatal catastrophe.'*

The instances, however, which Sir T. Watson quotes tell as much against, as in favour of general bloodletting. And indeed it would appear that more air in the lungs is required, rather than less blood in the system. Local bloodletting by means of leeches to the neck or upper part of the chest, or cupping to the nape of the neck, may sometimes prove beneficial. So also may blisters or milder counter-irritants; but these should not be applied immediately over the larynx.

When the mucous membrane is so swollen as to impede respiration and swallowing to a serious extent, scarification by means of a sharp pointed guarded bistoury, or some specially designed instrument, is often followed by speedy relief.

A somewhat remarkable case illustrating the effects of this method of treatment came under my observation in December 1866. A gentleman residing in Essex, fancying he heard poachers in the neighbourhood, got up in the middle of the night, went out carelessly dressed, and concealed himself for two or three hours in a ditch. The next morning he was seized with all the symptoms of intense laryngitis; and he died suffocated within eighteen hours. Three days afterwards the brother of this gentleman, depressed in spirits, and fatigued and almost exhausted, was exposed for some time to cold and wet. In the evening he was attacked by symptoms similar to those from which his brother had suffered. The next morning I saw him in consultation with his medical attendant, Mr. Jordison of South Ockenden. The soft palate, uvula, and pillars of the fauces were acutely inflamed, and very much swollen and œdematous. The epiglottis and aryteno-epiglottidean folds were in a similar condition. The patient's suffering was extreme; breathing was carried on with great difficulty; swallowing was impossible. I at once freely scarified the affected parts by a number of punctures and small incisions, and caused the patient to inhale the steam of hot water. A considerable quantity of serous or seropurulent exudation with some blood was discharged. In the course of half an hour the breathing was much relieved, and swallowing was accomplished without any great difficulty. The swelling of the parts rapidly subsided, and the next day, when I saw him again, the patient could breathe and swallow with comparative ease—indeed, almost naturally—but he still suffered from considerable general distress, and symptoms of pericarditis were recognised. Death took place twelve hours after my visit, or about sixty hours from the commencement of the attack. Post-mortem examination revealed the most intense inflammation of the whole pericardium I have ever seen. But the extent to which the faucial and laryngeal mucous membranes had recovered their natural condition and appearance was very remarkable.

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* Op. cit. p. 835.

Sir D. Gibb (following Dr. Horace Green) strongly advocates the application of a solution of nitrate of silver (three or four scruples to an ounce of water) in cases of acute laryngitis. The application may be made by means of a full bellied camel's hair brush on a curved aluminium wire stem, or by 'the laryngeal fluid pulveriser.' 'The effect of this proceeding is some considerable amount of burning heat, associated with comparatively little spasm, and sometimes dyspnœa, the last two persisting for may be a few seconds only. . . . The relief experienced, and the amelioration in the general symptoms is observed in periods ranging from half an hour to four hours, and the dyspnœa subsides very speedily.' *

If, as too often happens, the malady advances in spite of all such measures as those above suggested, or if the difficulty of breathing is too urgent to admit of their adoption, tracheotomy must be at once performed. In no class of cases probably is the value of tracheotomy as a life-saving operation more obvious and more pronounced. No definite rule can be laid down as to the period at which it may be desirable to operate. The surgeon must decide in each case when the proper moment has arrived, and must not hesitate to urge in the strongest terms the importance of every minute. There is far greater danger in delaying the operation too long, than in performing it unnecessarily early. The operation itself, if properly performed, is attended by little or no risk.† But it affords immediate relief from the direst suffering. It obviates altogether the recurrence of those frightful paroxysms of dyspnœa, in any one of which the patient may die suffocated. It affords perfect repose to the suffering parts, and saves them from the irritation of the hard-drawn breath. It thus allows opportunity for the subsidence of inflammatory action, and the absorption of effused material. It may not *cure*, but if performed in time, it certainly ensures a period of safety and freedom from distress, during which the cure may be effected by natural processes.‡

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* *On Diseases of the Throat and Windpipe*, by G. D. Gibb, M.D., 2nd edition, p. 196.

† See an essay by the present author: 'On Some of the Difficulties and Dangers of Tracheotomy,' in the *Practitioner*, April 1869.

‡ Out of 49 cases of tracheotomy for acute laryngitis of this kind which have come under my observation, or of which I have collected particulars, life was saved in 30, and death ensued in 19. In many of the fatal cases the operation was obviously performed too late; hence the result.

Further, in acute laryngitis the obstruction to respiration is, as a rule, confined to the larynx itself, and the parts below are rarely affected to any serious extent: the malady runs a rapid course, and under favourable circumstances subsides almost as quickly as it arises. Hence, not only is immediate relief almost absolutely certain, but there is little probability that the canula need be retained longer than a few days at the outside. While fully impressed with the danger of delay, the surgeon must nevertheless bear in mind that until the patient is actually dead it can never be too late to attempt the operation. And even if it should seem that the last breath has just been drawn, the operation should still be completed, and persevering efforts made to restore life by artificial respiration. Success has crowned such efforts in cases in which the general powers have not been too far exhausted by slow asphyxiation.

Chronic Catarrhal Laryngitis rarely occurs except as the result of one or more attacks of acute or subacute inflammation. As such, however, it is a comparatively common affection. In this respect it differs remarkably from 'Chronic Glandular Laryngitis' or 'Follicular Disease of the Larynx,' which, as a rule, is not preceded by any acute inflammatory symptoms, but on the contrary is chronic in character throughout its whole course.

Chronic catarrhal laryngitis is much more frequently met with among adult males than among females or children. This is due in great measure, no doubt, to the more constant exposure to vicissitudes of weather to which men are subject, as well as to the greater demands made upon their respiratory and vocal organs from the nature of their occupations. It often results in cases in which the acute symptoms have not been very severe; or in which they have subsided so far as to permit the patients to resume, without immediate inconvenience, their usual habits before the actual structural lesions have been sufficiently repaired. Hence the necessity for continued rest, watchfulness, and judicious treatment during convalescence from acute catarrhal laryngitis, even though the symptoms may have been comparatively mild. It need scarcely be remarked that when once the chronic affection is established, and so long as it continues, the patient is especially liable to a recurrence of acute attacks, any one of which may be fraught with danger.

The *symptoms* of chronic catarrhal laryngitis are:—hoarseness, want of tone, or some other unnatural condition of the voice;

a sense of effort during speaking (especially if at all prolonged), and of fatigue afterwards; frequent desire 'to clear the throat;' and more or less frequent cough, accompanied by occasional but scanty expectoration of thick, greyish, opaque, or semi-purulent mucus. A general sense of discomfort is sometimes experienced, but there is no pain in the part; nor is there any marked tenderness on pressure. Tranquil respiration is, as a rule, performed easily, and without the characteristic whistling or throttling sound emitted during inspiration in acute laryngitis. Forced respiration, however, is sometimes accompanied by unnatural sounds, which may be readily heard by means of a stethoscope placed over the larynx or trachea. The cough is no longer 'tearing' and painful, nor harsh, ringing, and 'brassy' as in the acute stages: though often hoarse, and somewhat sonorous, it is not distressing, and suffocative paroxysms very rarely if ever occur. Deglutition is easy and painless.

Thus it would appear that there is nothing absolutely distinctive in the symptoms of chronic catarrhal laryngitis; for very similar symptoms are associated with other totally different conditions to be hereafter discussed. Nevertheless, it is very important that a correct diagnosis should be made, inasmuch as the treatment requisite, as well as the probable issue, may differ very materially from what would be indicated in at any rate some of the other affections alluded to.

On *laryngoscopical inspection* the mucous membrane of the larynx is seen to be thickened and unnaturally red, and covered here and there by patches of greyish opaque mucus. The thickening and redness may be either more or less uniform, or irregular and much more pronounced in some parts than in others. In order of frequency the posterior aspect of the epiglottis, the aryteno-epiglottidean folds, the interarytenoid fold, the anterior aspect of the epiglottis, the false vocal cords, and the true vocal cords, are the parts usually affected. In general terms, the acute inflammatory attack is most frequently followed by chronic after-effects in those parts which are naturally most vascular, and most abundantly supplied with glandular structures. Ulcers are very rarely seen, but sometimes small superficial cicatrix-like patches may be observed; and occasionally even a dilated bloodvessel or two may be noticed ramifying in the mucous membrane.

The alteration of the voice does not bear any definite relation to the extent to which the true vocal cords are affected. There may be considerable hoarseness, or partial or even complete loss of voice, in cases in which the vocal cords themselves are found on examination to be almost or altogether healthy in appearance. In such cases the explanation may be due either to the swollen condition of the neighbouring parts, which may mechanically prevent the due approximation and tension of the true vocal cords, or may deaden or modify the sound produced by their vibration; or it may be that the surrounding infiltration, or some other effect of the inflammatory process, may hamper or otherwise interfere with the necessary action of the muscles. Whatever may be the explanation in any particular case, laryngoscopy has amply proved (contrary to what was formerly supposed) that the voice may be more or less obviously altered in character, or impaired in power, although the true vocal cords retain their integrity and healthy appearance. The converse is also true. The vocal cords may be visibly affected to some extent in various different ways, as hereafter indicated, without any very serious detriment to the speaking, if not to the singing voice.

The *course and duration* of chronic catarrhal laryngitis vary greatly in different cases. Sometimes it subsides spontaneously in the course of two or three weeks or more. Sometimes, especially if neglected, it remains obstinately persistent; and more or less permanent thickening or hypertrophy (so called) of the mucous membrane results. As a general rule, however, it is amenable to treatment. In some cases of long standing warty growths become developed. In others tracheal, bronchial, or pulmonary complications arise. In all cases there is great liability to fresh attacks of acute or subacute inflammation.

Treatment.—The treatment most likely to prove successful in simple catarrhal laryngitis, which has become chronic in character, depends somewhat upon the stage the malady may have reached, and the severity of the symptoms. It rarely happens, however, that any other than local measures are requisite, or indeed beneficial, except in so far as they may tend to the improvement of the general health and strength. But in all cases it is desirable, and in some absolutely necessary, to insist upon the importance of affording to the suffering parts as much rest, and as little excitement and irritation as may be practicable. All unnecessary exertions of the vocal and respiratory organs must for a time be avoided. The most complete rest possible can only be ensured by tracheotomy: and sometimes resort to this operation may be advisable even in the absence of any very acute symptoms.

In the earlier stages, the warm soothing vapour inhalations, so beneficial during the period of acute inflammation, must be replaced by more or less frequently repeated applications of astringent solutions, either in the form of spray or by the brush. In a large proportion of cases the inhalation of the spray of weak solutions of alum, tannic acid, or perchloride of iron, or chloride of zinc four or five times a day—or even of common salt, chloride of ammonium, or chlorate of potash—is all that is necessary. Sometimes, however—and indeed I believe in all cases according to some authorities—it is better to resort at once to the application of a strong solution of nitrate of silver (ʒj. to ℥j. of water) by means of the brush, or sponge probang.

In the more advanced stages, when the affection has become decidedly chronic in character, and all reasonable hope of spontaneous subsidence, or of improvement under milder treatment has passed away, the efficiency of the application of the nitrate of silver solution is most marked. The whole surface of the interior of the larynx may be wiped round with the brush; or by aid of the laryngoscope the application may be limited to those parts only which are especially affected. If the sponge is used, as originally recommended by Dr. Horace Green, precision of application is of course impossible; but the spasmodic contraction excited may serve to squeeze from the sponge a considerable quantity of the solution which may become diffused over the whole surface. But, as before stated, the brush is far preferable to the sponge. The application is easily made in accordance with the directions already given.

The spasmodic distress, sometimes though not always produced, very speedily subsides. The good effects are almost immediately perceptible, but are by no means transient. In some cases the application seems to act almost like a charm; and the voice, which before was painfully hoarse, is rendered at once comparatively natural in tone. The application should be repeated once daily, on alternate days, or less often, according to circumstances, until the cure is complete. At intervals between the applications frequent inhalations of the spray of solutions of common salt, chloride of ammonium, or alum may be recommended. Small blisters may sometimes be advantageously applied over the larynx; or counterirritation may be kept up by means of the strong tincture of iodine.

In cases of very long standing, and especially in those in which the tracheal and bronchial mucous membranes are also affected by chronic catarrhal inflammation, inhalations of balsamic and terebinthinate vapours often prove very beneficial. Turpentine, tar, the balsams of Tolu, Peru, and Canada, or their alcoholic solutions, gum benzoin or benzoic acid, and other similar substances, may be mixed (singly or in combination) with hot water in an appropriate vessel, and the vapour may be inhaled from time to time. Dr. Symonds recommends that substances of this kind should be mixed with æther or pyro-acetic spirit in a wide mouthed bottle from which the inhalation may be made.[*] Another method consists in keeping the atmosphere of the room, in which the patient may be, constantly impregnated with the remedial vapours, either by heating portions of the balsamic substances over a spirit lamp, or by putting them upon hot coals. This method is especially recommended by Trousseau and Pidoux, who state that by its persevering adoption cases of chronic laryngitis have been cured which had not been benefited by interrupted inhalations.[†] The same authors also refer to the good effects sometimes produced by the empyreumatic oil of burning paper ('l'huile de papier'), and recommend the inhalation of the smoke of cigarettes of paper, either plain or imbued with some arsenical or other medicinal solution.[‡]

Tar water may be inhaled in the form of spray; so also may weak solutions of chloride of zinc, nitrate of silver, &c. But these saline solutions appear to be less efficacious in cases of the class now under discussion than in those which are more recent, and in which the morbid condition of the mucous membrane is less extensive, and less confirmed in character.

Internal remedies sometimes prove useful, especially such as are indicated in catarrhal affections of the respiratory mucous membranes generally, as, for example, decoction of senega with ammonia, the various balsams, chloride of ammonium with tonics, &c.

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[*] The following formulæ are given:—Æther ℥j., benzoic acid ʒiv., Peruvian balsam ʒij.; mix. 2. Pyro-acetic spirit ℥ss., æther ℥ss., benzoic acid ʒiv., balsam of Peru ʒij.; mix. 3. Æther ℥ss., spirits of turpentine ℥ss., benzoic acid ʒiv., balsam of Tolu ʒij.; mix. 4. Æther ʒvi., pyro-acetic acid ʒij.; mix. The warmth of the hand is sufficient for volatilising these mixtures.—'Therapeutical Memoranda,' by J. A. Symonds, M.D., *British Medical Journal*, May 1868, p. 448.

[†] *Traité de Thérapeutique*, par Trousseau et Pidoux. Vol. ii. p. 840. Paris, 1869.

[‡] Ibid. Vol. i. p. 172.

Men who are subject to catarrhal and other chronic affections of the larynx should wear their beards; and women should be advised to take due precaution for the protection of their necks, especially when they are exposed to cold, or vicissitudes of temperature.

CHRONIC GLANDULAR LARYNGITIS. FOLLICULAR DISEASE OF THE LARYNX. DYSPHONIA CLERICORUM.

Chronic Glandular Laryngitis is a comparatively common affection.* It is most frequently, but by no means solely met with among those who are subject from time to time to continuous exertion of the voice, as clergymen, barristers, singers, and others. It essentially consists in more or less general enlargement and hypertrophy of the glandules and follicles of the laryngeal mucous membrane, the result of an inflammatory condition which usually commences very insidiously, and always progresses very slowly. It is often, but not invariably associated with a similar affection of the faucial, nasopharyngeal, and pharyngeal mucous membranes.

The most frequent cause probably is, as already indicated, continuous exertion of the voice. It is obvious that in prolonged speaking, reading, or singing, the demands made upon the vocal organs are not only greater than during ordinary conversation, but also in some degree different. In ordinary conversation the parts are subject to no great strain; and more or less frequent intervals of rest are afforded, during which the mucous membrane can recover its normal condition. But in the continuous and strong exertion of the voice constantly made by public speakers and singers, the mucous membrane is especially liable to become irritated by the forcible contact, and rapid passage over it, of cold dry air drawn in at each inspiration through the mouth, and not warmed and moistened by passing through the nasal fossæ. To allay the irritation and mitigate the dryness thus produced the mucous follicles are stimulated to increased activity, and for a time are able to secrete a sufficient quantity of mucus for the lubrication of the surface. Ultimately they are liable to become inflamed and hypertrophied. Further, it is worthy of note that the mucous membrane covering the arytenoid cartilages, and immediately adjoining parts, is more rich in glandular structures than any other portion of the laryngeal mucous membrane. Now this part is constantly subject to a very great extent of motion, and also, perhaps, to considerable strain, during forced vocalisation. And thus its glands are especially liable to be stimulated to increased activity; and the morbid condition under discussion may eventuate.

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* This affection appears to have been first accurately and fully described by Dr. Horace Green of New York, to whom also is due the credit of having especially taught and insisted upon the proper method of treating this and other affections of the larynx by the topical application of solutions of nitrate of silver, &c. See *A Treatise on Diseases of the Air Passages*, by Horace Green, M.D. New York, 1846.

It is important to bear in mind, however, that chronic glandular laryngitis may, and indeed often does occur in persons who have not been subject to any such continuous vocal exertions as those above referred to. In such cases exposure to cold and fog (especially if there is any obstruction of the nose), and the constant inspiration of air charged with irritating fumes or particles, appear to be the most frequent causes. Gibb states that he has seen this malady 'in a very exaggerated form in photographers, and in persons much exposed to the fumes of acrid chemicals in confined chambers, and its obstinacy in them is something quite remarkable.'* It is possible also that some constitutional tendency may favour the development of the malady. Indeed, Trousseau, Chomel, De Mussy, and others attribute its origin to the 'herpetic diathesis.'

The *symptoms* are :—alteration of the voice, and sense of effort in sustaining it—these are by far the most prominent and constant symptoms; more or less discomfort about the larynx, never amounting to pain but occasionally troublesome; dryness, and sometimes a sense of heat about the throat; and constant desire to clear the throat by 'hemming' and 'hawking.' There is little or no regular cough; and the expectoration which sometimes occurs, is slight, scanty, and mixed with saliva. There is neither difficulty in swallowing, nor tenderness upon pressure over the larynx. There are no definite constitutional symptoms: but the general health and spirits of the patient are often observed to be more or less depressed.

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* *On Diseases of the Throat.* Op. cit. p. 2.

The alteration in the voice depends upon the swollen condition of the arytenoid mucous membrane, which prevents the free movement of the cartilages, and thereby the necessary approximation of the vocal cords. The character of the voice varies somewhat. In the earlier stages it is simply wanting in clearness, and tone, and general reliability. In the later stages it becomes disagreeably harsh, husky, and hoarse. Sometimes it fails altogether, and the patient speaks in a husky whisper. As a general rule the alteration in the voice is most pronounced in the early morning, before the vocal organs have been at all exercised, and again in the evening, or after any considerable exertion of the voice, when the parts have become fatigued. Sometimes the patient will feel that he is able to carry on ordinary conversation with ease; but directly he begins to read or speak continuously in a loud voice he finds it impossible to proceed; or he only does so with great difficulty, sense of effort, and subsequent fatigue.

On inspection, the mucous membrane of the fauces and back of the throat is usually seen to present a more or less raw and irregularly granulated appearance; and the enlarged glandules, each (it may be) surrounded by a little halo of undue redness, may be recognised studding the surface. *Laryngoscopical examination* shows that the mucous membrane of the larynx is similarly affected; and in some cases, as already indicated, the malady is confined to the larynx. The parts most frequently and most obviously affected are, as might be expected, those in which the glandules are most abundant. These parts are the mucous membrane covering the arytenoid cartilages, the inter-arytenoid folds, the base of the epiglottis, and the ventricles and sacculi of the larynx. In cases of long standing, points of ulceration may sometimes be observed, especially about the base of the epiglottis. In others the glandules appear to be not simply enlarged, but distended with opaque yellowish material.

The mucous membrane covering the vocal cords is very thin, and contains very few, if any, glandules. It is very rarely, therefore, observed to be affected in this malady. It occasionally presents, however, isolated granulations which might possibly be mistaken for enlarged glandules. Such a condition is described by Türck under the name of *Chorditis Tuberosa*.*

The *course* of chronic glandular laryngitis is very tedious, and its *duration* very long, often extending over months or even years. It is not readily amenable to treatment; but by perseverance much good may generally be effected. Certain forms of new growth occasionally met with in the larynx may not improbably owe their origin to the localisation of this or some allied affection of the mucous glandules.

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* See Op. cit. p. 164.

Treatment.—The method of treatment, which experience has shown to be the most effectual, consists in the application by the brush of solutions of nitrate of silver or perchloride of iron, at intervals varied in frequency according to circumstances. The nitrate of silver, I believe, is, as a rule, the best application. Sulphate of zinc, sulphate of copper, and tincture of iodine,* have also been recommended, and indeed it may be stated that it is often well to vary the application. That which answers perfectly in one case, or at one period, proves less efficacious in others, or at other periods and under changed conditions in the course of the same case. Any points of ulceration that may be seen should be touched by means of the probe with solid nitrate of silver. Between such applications spray should be inhaled at frequent intervals during the day. The best solutions for the purpose are those of common salt, chloride of ammonium, iodide of potassium, and in some cases alum, or weak solutions of perchloride of iron. Certain mineral waters, especially such as contain the sulphides of sodium or calcium, have also been strongly recommended, as well as artificial solutions of sulphurous acid.

A method of treatment, which appears to be especially useful in this form of laryngeal disease, consists in slowly sucking medicated lozenges. The precise and careful observations of Fournié † prove (contrary perhaps to what might be expected) that certain portions of liquids swallowed, especially if swallowed slowly, or allowed almost insensibly to find their way down the pharynx, may become applied to the upper part of the larynx, and even diffuse themselves to some extent over its internal surface. The lozenges that appear to prove most useful are those containing chloride of ammonium, with or without cayenne, and the 'red-gum lozenges,' made by Messrs Squire.

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* Iodine, 1 part; iodide of potassium, 3 parts; distilled water, 18 parts. (Krishaber.)

† *Étude pratique sur le Laryngoscope et sur l'application des remèdes topiques dans les voies respiratoires.* Par le docteur Édouard Fournié. Paris, 1863. Also *L'Union médicale,* 5 fév. 1863, p. 248.

In this, as in other chronic laryngeal affections, the beard should be worn; and all due general precautions should be taken: for, as need scarcely be stated, an attack of ordinary catarrhal laryngitis may be readily excited.

Tonics and other constitutional remedies, varied according to circumstances, often prove very beneficial. It is especially necessary to reassure the mind of the patient; for he is but too often depressed in spirits, and apt to think his malady far more serious than it really is.

PHTHISICAL LARYNGITIS.

The larynx is found to be more or less seriously affected in a very large proportion of cases of tubercular phthisis.* In some cases the earliest recognisable indications of the commencement of the malady appear in the larynx. In others, when the malady is fully established, the laryngeal symptoms are the chief if not the only source of the distress from which the patient suffers. In others again, the condition of the larynx gives rise to effects which may to a considerable extent mask or simulate the physical signs and symptoms of incipient, and even of advanced pulmonary disease; and thus the diagnosis may be rendered very difficult.† Hence the importance of making careful laryngoscopical examinations in all cases of suspected phthisis, and especially in such as present indications of laryngeal mischief.‡ There can be no doubt, I think, that most of the so called 'cures of consumption' said to have been effected by local applications and inhalations (in so far as the accounts given may be considered reliable) have occurred in cases in which the larynx has been principally, if not solely affected.

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* Louis states that he found ulceration of the larynx in 63 out of 193 cases of phthisis which he examined. *Researches on Phthisis.* By P. C. A. Louis, M.D. *Sydenham Soc. Trans.* Lond. 1844. According to the records of postmortem examinations made at Guy's Hospital during the last six years, it appears that the larynx was affected in 47 out of 145 cases. The epiglottis is considered as part of the larynx; some cases, therefore, are included in these numbers in which the epiglottis only was affected.

† Cases occur from time to time in which affections of the larynx and trachea so closely simulate pulmonary disease that the patients are falsely supposed to be in a state of 'hopeless consumption.' On this subject see especially Dr. Scott Alison *On Morbid Conditions of the Throat in their Relation to Pulmonary Consumption*, p. 10 et seq. London, 1869.

‡ See the excellent remarks of Dr. Marcet on the value of the laryngoscope in the diagnosis of phthisis, in his Work *On Diseases of the Larynx.* Op. cit. p. 80 et seq.

In the very earliest stages, the *symptoms* of phthisical laryngitis are simply weakness, uncertainty, slight huskiness, and occasional failure of the voice, together with a more or less constant desire to clear the throat of the thick whitish mucus which accumulates from time to time. On *laryngoscopical examination* the mucous membrane is seen to present a peculiar dotted granular appearance, which is usually first and, as a rule, most conspicuously manifest on the posterior aspect of the epiglottis. This appearance is probably associated with the earliest deposit of tubercular material taking place in minute quantities at many distinct points. Somewhat later, the mucous membrane covering the arytenoid cartilages, and the aryteno-epiglottidean and interarytenoidean folds are affected, and sometimes present granulation-like elevations. At the same time more or less thickening of the mucous membrane may be observed. This thickening is an important and almost characteristic feature. It is to some extent due to increased deposit of tubercular material as well as to inflammatory infiltration. The false and true vocal cords, as a rule, become implicated only at a still later period, and usually on one side first. The false vocal cords partake of the general thickening, and often hide the true vocal cords; and these latter lose their clearness and brilliancy. As the malady advances ulceration occurs in one part or other, and usually first on the posterior aspect and lower part of the epiglottis. At or about this period the voice becomes hoarse; breathing is carried on with a sense of effort, and sometimes with difficulty and pain; the cough (before rare, and indeed often little more than a more or less frequent 'hemming') becomes constant, and sometimes painful; the expectoration is increased in quantity, and somewhat changed in character, becoming yellowish, and occasionally slightly streaked with blood; and sometimes, according to the position of the ulceration, there is pain in swallowing. So long as the ulceration is confined to the posterior surface of the epiglottis, swallowing is easy; but when the edges, upper border, and anterior surface of the epiglottis, and especially the glosso-epiglottidean folds are implicated, swallowing becomes painful. The ulcerative process, after it has once commenced, goes on—slowly it may be, but surely nevertheless. It extends gradually, not only superficially, but also in depth. Fresh centres of ulceration often appear; and bye-and-bye the deeper structures, areolar tissue, cartilages, &c. become involved, and in turn destroyed. Inflammatory swelling and œdema of the surrounding parts supervene. When the perichondrium is attacked the subjacent cartilage may either share in the ulceration and become gradually eaten away, as frequently happens to a greater or less extent with the epiglottis; or it may become partially or wholly necrotic, and may give rise to the formation of an abscess in the midst of which the necrosed portions may remain for a longer or shorter period. The arytenoid cartilages appear to be most frequently and earliest liable to become necrotic; next, the cricoid cartilage. The thyroid is comparatively rarely affected in this way. It would seem that before becoming necrosed the cartilage generally undergoes a process of calcification. Concomitantly with these morbid changes, the expectoration becomes abundant and purulent; the voice is lost; breathing becomes more constantly difficult and painful; and from time to time the most distressing paroxysms of spasmodic dyspnœa may come on. Under such circumstances laryngoscopical examination is often very difficult, not only on account of the general state of the patient, and the hyperæsthetic condition of the pharynx commonly existing in such cases, but also on account of the malposition, deformity, and swelling of the epiglottis resulting from the disease, and the abundant mucopurulent secretion by which the view is often completely obscured. When, however, a view is obtained, some idea may be formed as to the character and extent of the ulceration and destruction of parts that may have taken place. And it will usually be observed that the epiglottis and the posterior and upper parts of the larynx have suffered to the greatest extent; and that the ulcers are surrounded by more or less considerable thickening of the surrounding parts. Sometimes even projecting points of necrosed cartilage may be seen exposed, or bathed in pus. Postmortem examination (the opportunity for which as a rule speedily occurs) confirms the correctness of such observations, as well as the inferences drawn from them.

In some cases the ulcerative process does not commence so early, nor extend so deeply as thus stated; and it may even happen that healing may take place. In certain exceptional cases under favourable circumstances the process of healing may be watched from time to time by aid of the laryngoscope, as I know from my own observation, as well as from the statements danger of death from want of sufficient nourishment—tracheotomy should be performed without hesitation. The existence of even extensive disease in the lungs cannot be regarded as forbidding the adoption of this certain mode of relief from those symptoms which alone are distressing. Death from pulmonary phthisis is always easy; but death from laryngeal phthisis is preceded and attended by the direst suffering. Tracheotomy cannot ward off the one mode of death; but it is powerful to rob the other of its horrors. I have seen such immediate and such complete relief afforded by the operation in several cases, about the hopeless character of which there could be no doubt, that I should never hesitate to repeat it in similar cases, feeling certain that though life may not be saved, it may be prolonged, and suffering may assuredly be diminished during the remaining days. Further, it may be added, that cases do occur from time to time in which the whole disease is in the larynx, although the accompanying symptoms and wasting closely resemble those of general phthisis, and the physical signs are so far obscured as to afford no reliable indications. Three cases have come under my observation, in each of which the patient had been pronounced to be dying of 'hopeless consumption.' In each of these, more or less complete recovery speedily followed the performance of tracheotomy.

SYPHILITIC LARYNGITIS.

Syphilitic affections of the larynx are comparatively common.* They vary in character and importance with the period of the disease at which they arise, and also with the general health and condition of the patient.

During the *Secondary Stages* of Syphilis the mucous membrane of the larynx may be affected in a manner corresponding with the cutaneous eruption present; or it may become ulcerated, either independently, or in direct continuity with the characteristic ulceration of the soft palate, fauces, and pharynx, which so commonly occurs. The actual existence of the several conditions referred to has been fully established in very many cases, and may as a rule be readily recognised, by aid of the laryngoscope.* Without such aid the precise condition of the larynx in any particular case can only be inferred from the symptoms; and a considerable degree of uncertainty necessarily attends the diagnosis.†

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* According to my own experience a very large proportion (from thirty to forty per cent.) of the cases of laryngeal disease met with in hospital practice, among the surgical out-patients, are of syphilitic origin. In private practice the proportion is very much smaller, but still considerable.

Erythema of the laryngeal mucous membrane often occurs in association with syphilitic roseola of the skin. It may either extend from the fauces to the epiglottis and upper part of the larynx, and thence spread over the whole mucous surface; or it may appear in isolated, and more or less well defined patches. The mucous membrane in the parts affected presents on laryngoscopical inspection a dusky red or even purplish hue, and, it may be, a slightly elevated or swollen appearance.

More distinctly elevated and better defined patches (*mucous patches*) are sometimes seen in association with papular, squamous, and especially with tubercular affections of the skin.

The *symptoms* accompanying these comparatively simple conditions are not, as a rule, severe; nor are the results likely to prove serious. The voice is generally altered to some extent: it may become weak, wanting in tone, husky, or somewhat hoarse. But there is neither dyspnœa nor troublesome cough; nor is there local pain, nor any difficulty in swallowing that can be referred to the affection of the larynx.

The peculiar character of the voice so constantly noticed in secondary syphilis, and by some considered almost pathognomonic, would appear to depend in great measure upon one or other of the conditions of the larynx thus described, rather than upon the concomitant affection of the palate, fauces, and nasopharyngeal mucous membrane, the existence of which is more readily obvious, and to which alone the explanation is commonly attributed. Such, at any rate, is the conclusion indicated by the results of my own observations, as well as by those of others. It must be borne in mind that an affection of the mucous membrane of the larynx which is only superficial, and to the eye of the observer appears slight, may nevertheless, directly or indirectly, hamper to a considerable extent the movements necessary for the production of the natural voice.

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* On this subject, see especially the brochure of M. Dance, *Sur les éruptions du Larynx dans la période secondaire de la Syphilis.* Paris, 1864.

† Gerhardt and Roth state that in eight out of fifty-four cases of secondary syphilis under observation in Würzburg Hospital, the hoarseness was produced by mucous patches or condylomata of the larynx, which could be distinctly seen by aid of the laryngoscope. *Arch. für. path. Anat.* Bd. xxi. Heft 1.

It sometimes happens that laryngeal symptoms, similar in character to those just described, and associated with similar laryngoscopical appearances, arise either gradually, or almost suddenly, five or six months after the commencement of the malady, and after all obvious affections of the fauces and pharynx have subsided.

Syphilitic ulceration, as already stated, may extend from the fauces and pharynx to the larynx. But it very rarely does so during the secondary stages, except in cases in which the general health and strength are much broken down, or in which there has been continuous or frequent exposure, during the course of the malady, to the ordinary causes of acute laryngitis.

Occasionally small isolated spots of superficial ulceration, similar to those often observed in the mouth, appear on the laryngeal mucous membrane.

During the *Tertiary Stages* of syphilis the larynx is frequently affected in one way or other, and in many cases to a very serious extent.

Papulo-tubercular Elevations of the Mucous Membrane are by no means rare. They vary in size, and also in situation. In some instances they simulate warty growths of more innocent origin; in others they more or less closely resemble the condylomata met with on other mucous surfaces.* Sometimes these elevations subside under appropriate treatment, or perhaps spontaneously. In rare instances they increase to such size as to necessitate removal by operation. Sometimes they ulcerate and form the starting points of ulcerations, such as are described in the next paragraph. They have been observed on the false and on the true vocal cords, as well as on various other parts of the laryngeal mucous membrane. The chief *symptoms* noticed are hoarseness, or some other marked alteration of the voice, and sometimes occasional fits of dyspnœa.

Tertiary Ulcerations of the larynx are comparatively common. They may commence either superficially in the mucous membrane, and thence penetrate to the subjacent structures; or they may result from the effects of some more deeply seated affection—as for example softening down of gummatous deposits in the submucous tissue, or perichondritis or chondritis—followed by the formation of abscess. They may occur singly, and in any part; usually, however, several spots are attacked, either simultaneously or one after another. The epiglottis is generally affected first, and in a large proportion of cases is the part most extensively destroyed. Sometimes its edges are gradually eaten away; sometimes its substance early becomes perforated, and the perforation extends until the edges are reached. In such cases semidetached portions, flapping loosely, occasionally give rise to much embarrassment. The false and true vocal cords are often affected—in some cases by comparatively superficial, but in most by deeply penetrating ulceration. The mucous membrane covering the arytenoid cartilages, and the posterior part of the larynx generally, is comparatively less frequently and less early attacked by syphilitic than by phthisical ulceration; but it is liable to become involved sooner or later. The cartilages (and especially the arytenoids) may become carious or necrotic, as the result either of deep extension of ulceration commencing in the mucous membrane, or of perichondritis arising independently of any such superficial affection. Portions of dead cartilage may become detached, and acting as foreign bodies, may give rise to the most serious symptoms; or they may be expectorated, or removed by operation; or they may remain at any rate partially fixed, and in such case may become the foci of abscesses, and the excitants from time to time of the most dangerous paroxysms of spasmodic dyspnœa.

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* M. Cusco has especially called attention to growths of this description, and to their syphilitic origin (see M. Dance. Op. cit.). His observations accord with those of Türck and other observers, and are confirmed by my own experience.

The *symptoms* vary according to the extent of the ulceration and the part especially affected. There is invariably marked alteration of the voice, sometimes hoarseness, sometimes complete aphonia, and sometimes one or other of the various intermediate conditions which are readily recognisable but difficult to describe or name. There may or may not be dyspnœa; and the dyspnœa, if present, may be slight, or of the most distressing character. In some instances, and especially in those in which the cartilages are affected, there may be occasional attacks of severe dyspnœa, with intervening periods of comparative or even complete ease; and sometimes suffocative spasm of the larynx may occur.

Two or three years ago, a patient (in the Venereal Ward in Guy's Hospital) who had suffered from occasional and slight but evanescent attacks of dyspnœa, was suddenly seized with such urgent and distressing difficulty of breathing, that he rushed from the ward to seek help. He reached the bottom of the stairs, and there fell dead from suffocation. On postmortem examination, a detached portion of necrosed cartilage was found in the glottis.

It is well to bear in mind, therefore, that in such cases dyspnœa of the most dangerous character may supervene suddenly, and almost without warning. Indeed, it may be asserted that patients suffering from severe tertiary affections of the larynx require the most careful watching, for danger may arise at any moment. In some cases there is difficulty in swallowing; and often more difficulty in swallowing fluids than solids. The former (on account of the condition of the epiglottis) are more liable than the latter to 'go down the wrong way.' But the slight degree of difficulty, and the absence of all pain in swallowing, sometimes observed in certain exceptional cases of this kind, in which the epiglottis has been even extensively destroyed, are very remarkable.

The *course and duration* of these tertiary affections of the larynx, as may be readily understood, vary greatly. In some cases, under appropriate treatment cicatrisation may take place; but in such it constantly happens that very serious deformities of the parts result either from the loss of substance, or from the subsequent contraction of the cicatrices that may have occurred. The voice is, as a rule, permanently impaired; and breathing and swallowing may be rendered more or less difficult. Attacks of acute laryngitis, attended by more or less spasm, are liable to be excited by comparatively slight causes, and may lead to a fatal result if timely relief is not afforded, or if the safety of the patient has not been previously secured by the performance of tracheotomy.

The *general diagnosis* of syphilitic affections of the larynx is not often difficult. The history of the case, and the presence of the syphilitic cachexia, together with the coexistence of some more unmistakeable signs or symptoms (such as ulcers or cicatrices about the palate and fauces, cutaneous eruptions, nodes on the tibiæ, &c.) generally serve to indicate the nature of the malady.

But beyond the general indications afforded by the history of the case, and by the presence or absence of other local affections of syphilitic origin, certain special indications may be obtained, and the diagnosis may often be clearly established, by aid of the laryngoscope.

The dusky hue and patchy appearance of syphilitic erythema of the larynx differ notably from the bright diffused redness of simple catarrhal inflammation; and the papules, flattened tubercular elevations of surface, and condylomata of syphilis can lly be mistaken for the enlarged mucous follicles of glandular ngitis—still less for the dotted, granular appearances pre- ed in the earlier stages of laryngeal phthisis. There may, ever, be considerable difficulty in distinguishing between a ilitic tubercle or condyloma beginning to ulcerate, and a ll epithelioma, especially if situated on the posterior wall of larynx. Such difficulty has arisen in more than one in- ce under my observation. In any doubtful case it is well to the experiment of 'specific' treatment before expressing any ded opinion. Antisyphilitic remedies and local treatment almost certainly effect a cure in the one case; and in the r, though necessarily useless, they cannot do any great unt of harm.

he deep and extensive ulceration of the more advanced es of syphilitic disease of the larynx not only gives rise to ptoms, but on laryngoscopical inspection may present earances, which more or less closely resemble those of hisical disease on the one hand, and epithelioma on the other. ay not be easy, but it is always important to determine rately the nature of the malady, as well as the extent of mischief. For, as need scarcely be stated, the treatment h is requisite and likely to prove more or less successful in s of syphilitic origin, might be absolutely injurious in those ciated with phthisis, and altogether useless, or perhaps se than useless, in epitheliomatous disease. The prognosis must obviously depend in great measure upon the satis- ory determination of the origin of the local affection.

he chief distinctive features presented by syphilitic, phthi- l, and epitheliomatous ulceration of the larynx may be stated llows.

yphilitic ulceration usually attacks the epiglottis first. It nds rapidly, and is emphatically destructive in its progress. nvolves the submucous tissues at a comparatively early od; and thus the whole thickness of the epiglottis may dily become perforated, or some other part of the larynx suffer corresponding destruction of substance. It is not, rule, surrounded by any marked or extensive thickening; its edges are often more or less swollen, and red. Such rent or real thickening as there may be generally attends er than precedes the ulcerative process. The accompanying ectoration is thick, tenacious, and yellow or yellowish green olour.

Phthisical ulceration usually commences in the mucous membrane covering the upper and anterior parts of the arytenoid cartilages. The posterior aspect of the epiglottis may often be seen at the same time free from ulceration, but presenting the dotted granular appearance already described. It is almost invariably preceded as well as always attended by marked and characteristic thickening. It progresses comparatively slowly; and, as a rule, does not penetrate at an early period to the deeper structures. When it attacks the epiglottis, the edges present an irregular, somewhat worm-eaten and greyish appearance. The accompanying expectoration is generally more frothy, and thinner, and more mucopurulent in character than in syphilitic ulceration, and much more abundant than in epithelioma.

Epitheliomatous ulceration of the larynx in a very large proportion of cases commences on the pharyngeal aspect of the mucous membrane covering the arytenoid or cricoid cartilages, and comparatively rarely in the interior of the larynx. It is associated with very considerable and irregular thickening, due to the development and increase of the new growth. Its surface presents a dirty greyish appearance, and its edges are elevated. It progresses very slowly. The accompanying expectoration, at any rate during the earlier stages, is scanty, thin, and often more or less sanious in character. In the advanced stages it becomes abundant, more or less purulent, and sometimes tinged with blood.

The other local and constitutional signs and symptoms, which in syphilitic and phthisical cases may aid the diagnosis, are altogether wanting in cases in which the laryngeal ulceration is simply epitheliomatous in origin.

Lupous, and other Strumous ulcerations of the larynx which cannot, strictly speaking, be classed as phthisical, sometimes occur,* and are with difficulty distinguished from those of syphilitic origin. In some cases of the kind that have come under my observation, it has seemed that the affection has probably been due to congenital syphilis. The age of the patient, the history of the case, and the presence or absence of other local or general indications, afford the best guides in the diagnosis.

Treatment.—In syphilitic laryngitis, local as well as conutional treatment is very often necessary, and in the more ere forms is urgently—nay, imperatively demanded.

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* See Türck, Op. cit p. 425.

he comparatively slight affections which so commonly occur ing the secondary stages of the malady, and in which there imply diffused or patchy erythema of the mucous membrane h but little swelling, as a rule, subside under constitutional tment. But all unnecessary exertion of the voice, and ecially exposure to cold and wet, should be sedulously ided. Mercury in one form or other is the only remedy n which any reliance can be placed; and the appearance aryngeal symptoms may generally be accepted as an indica- that it is desirable to get the system under the influence of drug as speedily as may be practicable and safe. The use he calomel vapour bath may be especially recommended in h cases, inasmuch as beyond its general efficiency it affords cial facility for the occasional inhalation, and thereby the l application of the mercurial vapour. The value of such alation, however, is more pronounced in cases in which ration has commenced.

econdary ulcerations of the laryngeal mucous membrane ether in continuity with others about the fauces or pha- x, or appearing independently) may often be advantageously ted by local applications. But such applications must be arded simply as adjuvants to the general treatment indicated, not as in any measure rendering such general treatment ecessary. The frequent inhalation of the spray of weak tions of perchloride of mercury with chloride of ammonium, f sulphate of copper, very often appears to be beneficial. In e cases the insufflation of calomel, or an occasional inhala- of the vapour of calomel, may be recommended. In other es the application of solid nitrate of silver or sulphate of per, from time to time, to the ulcerated surface does good. here is much irritability, however, the inhalation of warm thing vapours, or the spray of anodyne solutions, is for a e preferable.

yphilitic affections of the larynx occurring during the tiary stages of the malady almost invariably require the ninistration of iodide of potassium in full doses (gr. xx. to gr. .) three or four times a day. In some cases the addition of ine may be useful. In others, iodide of iron and tonics erally are indicated. Local measures are very often necessary conjunction with the constitutional treatment indicated, and in all cases may do much to aid the cure. Condylomatous and papillary elevations of the surface may be touched daily, or less frequently, with the solid nitrate of silver. In cases in which ulceration has occurred, inhalations of the vapour of iodine, or of the spray of solutions of iodide of potassium and iodine, are very useful. If the ulcers are comparatively superficial the application of solid sulphate of copper daily, or twice daily, often proves beneficial. If the ulcerated surface is extensive, a saturated solution of sulphate of copper may be advantageously applied by the brush. Cases occasionally occur in which the internal administration and also the local application of mercurials in conjunction with preparations of iodine are indicated. The more powerful applications and medicines may sometimes be beneficially alternated from time to time with the exhibition of chlorate of potash, both locally in the form of solution, spray, or powder, and internally in combination with tonics. Swollen and œdematous parts of the mucous membrane may be freely scarified with the greatest advantage; and any spot at which an abscess appears to have formed may be punctured. If any portion of exposed and necrosed cartilage should be seen, an attempt may be made to remove it by means of appropriate forceps.

In every case in which breathing becomes seriously impeded, whether in the secondary or tertiary stages of the malady, tracheotomy should be performed without hesitation. Ample experience proves that in syphilitic disease of the larynx this operation may be regarded as fairly successful, not only in averting impending danger, but also in affording opportunity for the more or less complete restoration of the parts affected.* The operation is especially called for in cases in which paroxysms of spasmodic dyspnœa have occurred, or in which laryngoscopic examination shows that the ulceration is extensive and deep, and some portion or other of necrotic or carious cartilage is exposed. In such cases recovery without operation, though by no means impossible,† is at any rate improbable;

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* I find that in 38 out of 72 cases of tracheotomy on account of syphilitic disease of the larynx which have come under my observation, or of which I have collected particulars, life was preserved. In 19 of these the patients were enabled sooner or later to dispense with the canula; in 10 it was necessary to wear the canula permanently; in 9 the ultimate results are not stated.

† See a remarkable case recorded by Gibb (op. cit. p. 38), in which a crater-like elevation was seen on one side of the glottis. From this, portions of the cricoid cartilage were discharged and expectorated on threedifferent occasions.

and the patient is in peril of his life (peril which at any moment may become imminent) until a new way of breathing is secured to him.

The cicatrices of syphilitic ulcers of the larynx have a great disposition to contract, and such disposition is favoured in many cases by the loss of substance which may have occurred. Permanent impairment of the voice, and more or less serious impediment to respiration may result. It not infrequently happens that tracheotomy becomes necessary after partial or complete cicatrisation has taken place, in consequence either of the resulting contraction of the parts, or of an attack of laryngitis incidentally occurring. The damaged parts are prone to a low subacute or chronic form of inflammation, which at any moment may become exacerbated and give rise to urgent symptoms. In some cases the passage gradually becomes more and more free in consequence of the absorption of effused material; and in such, if it should have been necessary to perform tracheotomy, the canula may be removed at an earlier or later period. In other cases the contraction increases, and the tracheotomy canula must be worn during the remainder of life. In some few cases it may seem desirable to divide the cicatrices by operation, and to attempt the dilatation of the air passage. But so far as I have been able to ascertain, no very satisfactory result has hitherto been obtained in any case in which the mischief has been in the larynx itself. Much good however has been effected in several cases in which the contractions have been situated above the larynx. Some encouragement to further attempts may perhaps be derived from the successful results which have been obtained in instances in which the contractions have resulted from the effects of injuries, although, as is obvious, the conditions in such cases must necessarily be somewhat different.*

ERYSIPELATOUS LARYNGITIS.

Erysipelatous Laryngitis in its severer forms is an extremely dangerous, but happily by no means a common affection. It is most frequently met with, perhaps, in hospital practice at periods when erysipelas is prevalent. It may either occur in association with erysipelas of the face and neck by direct extension to the fauces, and thence to the larynx; or the fauces and larynx may be first affected, and death may ensue without any appearance of erysipelatous redness on the external surface.

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* See the Article on INJURIES OF THE NECK. Vol. II. p. 456.

The *local symptoms* are:—soreness of the throat; difficulty in swallowing; pain and tenderness about the larynx; hoarseness, and subsequently extinction of the voice; and difficulty in breathing, which may rapidly become more and more urgent. These local symptoms are preceded and attended by the constitutional symptoms (such as feverishness, rigors, &c.) associated with erysipelas generally. On *inspection*, the mucous membrane of the fauces is seen to be unnaturally red and swollen, and sometimes more or less dry and shining. By aid of the laryngoscope, the mucous membrane of the larynx may be seen to be similarly affected. As the malady advances the submucous tissue becomes infiltrated; the swelling increases, and its œdematous character is pronounced; the glottis becomes more and more encroached upon, and respiration is consequently more and more impeded.

Unless the malady is checked in its progress, or relief is afforded from the urgent symptoms, the patient usually sinks into a 'typhoid' state, and dies either from exhaustion or suffocation. Such is the common result.

On *post mortem examination* the mucous membrane of the larynx appears inflamed, swollen, and œdematous. In many instances it is of a dirty greenish colour in places; and the submucous tissue is infiltrated with seropurulent matter, and here and there sloughy. Small collections of pus and sloughs of the areolar tissue are occasionally seen round the glottis. The tracheal mucous membrane is also often found to be inflamed. The mucous membrane of the fauces is similarly affected; and the base of the tongue and the tonsils sometimes present a more or less extensive sloughy appearance.

Treatment.—The general treatment must be from the first stimulating and supporting; and no effort must be spared to counteract the depressing influences of the disease. As much nourishing and easily digestible food as can be taken, together with a very liberal allowance of wine or brandy, should be given at frequent intervals in such proportions as can be swallowed. The tincture of the perchloride of iron with quinine should be administered in full doses, or some other powerful tonic combined with chlorate of potash, or ammonia.

In some cases it may be desirable to commence the treatment by the administration of an emetic followed by a purge. But the propriety of so doing must be decided by the general condition of the patient, and the progress the malady may have made. Locally, the application of a strong solution of nitrate of silver or perchloride of iron may be recommended in the earlier stages. In the more advanced stages, especially when there is much œdema, free scarification of the mucous membrane, and frequent inhalations of warm soothing vapours and steam may afford the most marked relief. If the dyspnœa becomes urgent tracheotomy must be performed. It is true that from the nature of the malady there is often but little hope of a succesful result; at the same time there can be no doubt but that by the operation a chance of prolonging life is afforded that could not otherwise be obtained; and that by it at any rate the last hours of the patient may be rendered comparatively free from suffering.*

It may be worthy of remark that apart altogether from any such serious affection as that thus described, it not infrequently happens that in cases of erysipelas of the scalp and face, there is some soreness of the throat, slight difficulty of breathing, and some alteration of the voice, such as weakness or hoarseness.

DIFFUSE CELLULAR LARYNGITIS. ACUTE ŒDEMATOUS LARYNGITIS.

Diffuse inflammation of the areolar tissue of the larynx is a comparatively rare, but very formidable malady. It corresponds to the diffuse cellular inflammation not infrequently met with in other parts of the body; but it is especially dangerous on account of the impediment to respiration and swallowing to which from its situation it necessarily gives rise. It is probably closely allied in nature to erysipelatous inflammation, from which, however, it differs in the fact that in it the submucous tissue is primarily attacked, and the mucous surface is left free, or only becomes secondarily affected. In erysipelas, on the other hand, the mucous surface is first affected, and the submucous tissue is only secondarily or concomitantly involved.

Diffuse Cellular Laryngitis may either occur in association with previously existing diffuse cellular inflammation of the neck, in which case it seems to form a part of the more general affection; or it may commence in or about the submucous tissue of the pharynx and larynx, and thence spread through the neck generally. In some instances, however, it may cause death from suffocation or exhaustion before any considerable extension to other parts can have taken place.

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* A fatal result ensued in 10 out of 15 cases of tracheotomy performed on account of erysipelatous laryngitis which have come under my observation, or of which I have collected particulars; in 5 cases the patients made good recoveries.

In this malady the appearance of the local affection is usually preceded, and its onward progress is invariably attended by more or less severe constitutional disturbance, and especially by great general depression. At the onset the patient often complains of having felt unwell for some days, and of having suffered from headache, lassitude, lowness of spirits, and other febrile symptoms. Soreness of the throat, at first slight, but rapidly becoming severe, is noticed early; and rigors soon occur. As the malady progresses breathing becomes impeded; and a sense of weight and oppression at the chest is complained of. There may be slight hacking cough, attended by the expectoration of a little whitish glairy mucus. The soreness of the throat increases; the fauces and tonsils become much swollen, and of a dusky red colour; and sometimes ulcerated patches appear upon them. Somewhat later the glands behind and below the jaw become enlarged; the neck becomes painful; and the mouth can only be opened with difficulty. The throat is tender when external pressure is made on one side or both. Occasionally a constant and profuse discharge of saliva takes place. Still later, the neck becomes swollen, and the swelling extends and increases; respiration is more and more impeded; and swallowing is rendered almost or quite impossible. The patient sinks into a typhoid condition, and dies exhausted; or, as perhaps more frequently happens, he is killed by a process of slow asphyxiation. In some cases, however, a sudden paroxysm of spasmodic dyspnœa proves fatal at a comparatively early period in the progress of the malady; and in others, the laryngeal œdema increases very rapidly, and causes speedy suffocation. Either of such results may ensue before any considerable, or even any perceptible general swelling of the neck has taken place.

So far as I have been able to ascertain, no satisfactory laryngoscopical examination has hitherto been made in any severe case of this kind; and therefore the actual appearances during life cannot be described. They may, however, be predicated with sufficient accuracy from what has been constantly observed on post mortem inspection. Moreover, the swollen and œdematous condition of the upper part of the larynx may generally be easily ascertained by digital exploration. In the earlier stages and less severe forms of the malady, laryngoscopical examination to some extent is comparatively easy; and the mucous membrane of the upper parts of the larynx may be seen to be distended and swollen, and dusky or paleish in colour. The colour of the mucous membrane differs altogether from the bright scarlet redness of acute catarrhal inflammation. The lower parts of the larynx are more or less completely concealed from view.

On *post mortem examination* extensive inflammatory œdema of the submucous tissue of the larynx and neighbouring parts is invariably found. In some cases one side is much more affected than the other. When cut into, the areolar tissues present an infiltrated, and sometimes more or less sloughy appearance. The infiltration is serous, seropurulent, or purulent in character, according to the period at which death has occurred, and the circumstances under which it has taken place. The tissues of the neck are found in many cases to be infiltrated to a greater or less extent with serous, seropurulent, or fibrinous exudation. In cases in which there has been much swelling, they often present almost a brawny consistency. Sometimes the infiltration extends upwards behind the pharynx, sometimes downwards alongside the trachea and œsophagus, even into the mediastina. Occasionally the infiltration in the neck is purulent in character, and in some instances the areolar tissue is sloughy and putrid.

Treatment.—The same general treatment is required as that recommended in erysipelatous laryngitis. But in this malady local applications of nitrate of silver, &c. are far less likely to prove efficacious. The swollen parts should be freely and deeply scarified at a comparatively early period; and the scarification should be repeated without hesitation from time to time according to circumstances. After the scarification warm soothing vapours should be frequently, or almost constantly inhaled for a time. At a subsequent period the spray of astringent solutions may be inhaled with advantage. Further, in cases in which the neck is much swollen, it may be desirable to make careful but free incisions into it, not only to evacuate pus or to allow of the escape of serous effusion, but also with the view of diminishing the tension and consequent pressure upon the trachea and œsophagus.

If such means fail to afford relief, and the dyspnœa is urgent, tracheotomy must be performed, although the difficulties attending the operation may be great, and the chances of a successful result may appear small.

An excellent illustration of the value of tracheotomy in cases of this kind occurred some few years ago in the practice of Mr. Pollock at St. George's Hospital.

The patient (a butcher, aged forty-three) was admitted with severe and extensive diffuse cellular inflammation of the neck. Urgent laryngeal symptoms soon supervened. Tracheotomy was performed, and the patient made a good recovery in a comparatively short space of time.[*]

OTHER FORMS OF LARYNGITIS. EXANTHEMATOUS LARYNGITIS; TRAUMATIC LARYNGITIS, &c.

Consecutive inflammation of the larynx occasionally occurs in the course of various general maladies, other than those the laryngeal complications of which have been already described in detail. It is especially liable to occur in measles and typhoid fever. It is more rarely met with in smallpox and typhus, and still more rarely in scarlet fever.

The *Laryngitis of Measles* is catarrhal in character, and, in most instances, appears soon after the nasal catarrh. Respiration may be more or less embarrassed; and sometimes there is remarkable harshness of the voice, and frequent harsh cough. In young children the breathing is occasionally stridulous, and the cough ringing. The consequences are very seldom serious; but it is well to bear in mind that they may possibly become so. In some rare instances, dangerous, and even fatal œdema of the larynx has ensued; and in some, the œdema has persisted after the general symptoms have subsided. In such cases the laryngeal symptoms have appeared early, and from the first have been very acute. As a general rule, the mucous membrane of the larynx is simply affected in a manner corresponding to the cutaneous eruption; and the symptoms subside as the eruption disappears. It is not often that any local treatment is necessary or desirable, beyond the application of warm poultices and fomentations to the neck, and the inhalation of warm soothing vapours. If, however, the symptoms are severe and persistent, the same treatment may be required as that recommended in cases of acute catarrhal laryngitis (see p. 539).

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[*] See *Lancet*, September 1863, p. 276.

The *Laryngitis of Typhoid Fever* is ulcerative and destructive in character.* It may either commence during the earlier or middle stages of the malady, concomitantly with the ulceration of the intestinal glands and mucous membrane, and speedily give rise to serious symptoms, or even to a fatal result; or its existence may first become manifest during the period of convalescence and after all febrile symptoms have subsided. The ulcerations which occur during the earlier stages are generally situated either on the aryteno-epiglottidean folds, in the neighbourhood of the arytenoid cartilages, or, according to Rokitansky, about the lateral walls of the larynx. They may give rise to more or less severe functional disturbance—often to cough, and difficulty of swallowing, and, somewhat less frequently, to difficulty of breathing. The difficulty of breathing usually corresponds to the amount of inflammatory œdema that may have occurred. It is sometimes difficult to determine how far the cough may depend upon laryngeal, and how far upon bronchial affection. It is probable that in a large proportion of cases, if the patient survive the general malady, these ulcerations heal favourably, like the corresponding intestinal ulcerations. But in cases in which the symptoms become manifest at a comparatively late period in the course of the malady, or in which ulceration goes on insidiously, and perhaps almost unnoticed until seeming convalescence has taken place, the perichondrium and cartilages (and especially the cricoid) are very liable to be implicated to a greater or less extent. Under such circumstances the consequences are often very serious. Necrosis of the cartilages may result in association with typhoid fever, not only from gradual penetration of the ulcerative process, but also in some cases as an effect of some deep-seated inflammatory condition commencing in or about the cartilages themselves.

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* This affection is the *laryngo-typhus* of the Germans. It appears to have been first definitely and fully described by Louis, in whose treatise, entitled *Recherches sur la Fièvre typhoïde* (Paris, 1841), much valuable information on the subject is contained. Trousseau especially refers to the laryngeal complications of typhoid fever, and gives some excellent illustrative cases in his *Clinique médicale*, Vol. i. p. 299; Paris, 1868. Chomel, Rokitansky, Wilks (*Med. Times and Gaz.*, 1862, p. 276), and others also fully discuss the pathological history, or give examples of typhoid disease of the larynx. The appearance of the ulcers is so characteristic that Louis says that, if observed in a patient who had died of some acute disease, they would be sufficient to indicate almost certainly that the affection had been typhoid fever. Op. cit. p. 321.

A remarkable instance came under my observation in Guy's Hospital, while I was acting as Ward Clerk to the late Dr. Addison. A boy, ten years of age, had apparently recovered from typhoid fever. One morning he complained of pain in the throat. A day or two afterwards he expectorated some pus. The next day his neck was observed to be swollen and emphysematous. The emphysema rapidly spread over the whole body, even to the scrotum and penis, which became enormously and peculiarly distended. Two days later death occurred. On post mortem examination a small ulcerated opening leading down to a necrosed portion of the cricoid cartilage, was found below the glottis, on the right side. Through this opening evidently the air had escaped during expiration into the areolar tissue of the neck, and had thence spread over the body. No other case of any kind has ever come under my observation in which the emphysema was so extensive and so general. The cavities as well as the superficial parts of the body were affected; and indeed it appeared probable that death had resulted from the impediment to respiration caused by the intrathoracic emphysema.

In a certain proportion of cases in which the symptoms are not severe, recovery may take place without any local treatment beyond the application of warm fomentations to the neck, and the inhalation of warm soothing vapours. The general treatment of typhoid fever must, of course, be carried out. In all cases, however, in which the symptoms are urgent, tracheotomy should be performed. It is undeniable that the statistical results hitherto obtained, do not appear to be very encouraging.* At the same time the success which has resulted in some cases justifies resort to this operation, which indeed alone offers any chance of safety.

In the *Laryngitis of Smallpox*, the mucous membrane of the larynx is affected in a manner which varies with the stage of the malady, and corresponds more or less closely with the more obvious external appearances. In the earlier stages, pustules, may arise analogous to those observed on the cutaneous surface. Neumann, Türck, and Krishaber, all state that they have seen, by aid of the laryngoscope, true variolous pustules, surrounded by circumscribed inflammatory areolæ, upon the true vocal cords, as well as on other parts of the laryngeal mucous membrane. The symptoms are, hoarseness, cough, and more or less uncomfortableness or pain about the larynx. About the eleventh or twelfth day, at the period at which swelling of the face and extremities is especially liable to occur, œdema of the larynx may come on; and respiration may be more or less seriously, or even fatally impeded. During the still more advanced stages of the malady, at or about the period at which abscesses are occasionally formed in other parts, perichondritis and subsequent necrosis of cartilage, with all the attendant symptoms and dangers, may ensue.

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* I find that out of thirty-five recorded cases in which tracheotomy was performed on account of 'typhoid' disease of the larynx, in twenty-four death ensued. In eleven life was saved; but in several of them the voice was permanently impaired, and the canula could never be dispensed with.

In *Scarlet Fever* the larynx may either be affected during the earlier stages by extension of inflammation or inflammatory œdema from the pharynx; or, in common with other parts, it may become œdematous as the result of consecutive kidney disease. The true scarlet fever eruption very rarely indeed, if ever, invades the larynx. The local treatment necessary in each case may be gathered from what has been already stated in regard to similar affections arising in connection with other maladies.

It may here be remarked that in *Bright's Disease* the larynx may participate in the general œdema and this may prove dangerous or fatal from the obstruction to respiration to which it gives rise.

Gouty Laryngitis may possibly be considered to possess small claim to be described as a distinct form of disease. But it is worthy of remark that in gouty subjects chronic laryngeal affections are by no means uncommon. Sometimes they are very troublesome, and even distressing to the patient; and they are always difficult to treat successfully unless the existence of the general condition upon which they depend is fully recognised, and modified by appropriate constitutional remedies. In many cases they occur in association with gouty bronchitis and tracheitis, but even in some of these the laryngeal symptoms may attract most attention, and give rise to most trouble and danger. In certain rare instances acute laryngitis of very formidable character has been observed to occur in connection with an attack of gout.

Traumatic Laryngitis has been already described in the chapters treating on the various injuries—as wounds, blows, burns, &c.—from which it may result (see Article on INJURIES OF THE NECK, Vol. II.).

NEW GROWTHS. POLYPI, &c.

New growths in the larynx were formerly supposed to be of very rare occurrence; and indeed, except in some few and very remarkable instances, their presence could only be determined on post mortem examination. Since the laryngoscope has come into use, however, a large number of cases have been recorded; and many more at present unpublished have come under observation, in which growths in the larynx have not only been recognised during life, but have been successfully removed by operation. There is probably no other class of cases in which the value of the laryngoscope has been so signally demonstrated. It would appear not unlikely that this circumstance, together with the interest naturally attaching to cases of this kind and the attention consequently attracted to them, has been the means of leading to the now prevalent idea that they are even more common than is actually the fact. They are certainly more frequent than was formerly supposed; but they nevertheless constitute only a very small proportion of the affections of the larynx that come under every day observation. Krishaber states that such growths are to be 'met with in two or three per cent. of the cases of maladies of the larynx exclusively local and chronic.'* My own experience would lead me to the conclusion that they are much less frequent even than this.

The new growths in the larynx met with in different cases vary in character, size, and precise situation, and also to a corresponding extent, in the symptoms to which they give rise and in the degree of danger they immediately involve. They may occur at any period of life; in some instances they are congenital;† in others they do not appear until advanced age. They are almost equally common in the two sexes. No satisfactory conclusion has yet been arrived at as to the local or general determining causes of their appearance in the majority of cases. In some instances, however, they may be of syphilitic origin; in others the so called new growths may be simply the thickened elevations of surface, or the 'vegetation-like' granulations of phthisical laryngitis.

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* Op. cit. p. 730.

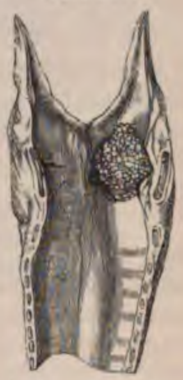
† One case has come under my own observation in which it was evident that the growth had commenced before, or immediately after birth. Another case, also congenital, is recorded by Mackenzie (*Path. Trans.*, 1865, p. 38). Three are recorded by Gibb (Op. cit.) and several are quoted by Causit in his *Étude sur les Polypes du Larynx chez les Enfants.* Paris. 1867.

Some approximative idea as to the relative frequency of the different kinds of new growth met with in the larynx may be obtained from the following table, which has been carefully compiled from the published records of cases, from the results of my own observations, and from the descriptive catalogues of various museums.

Nature of growth.	Number of cases.	Number in which the growths were recognised during life.	Number in which they were only found after death.
Papillomatous or warty	110	65	45
Fibrous	23	13	10
Fibrocellular. Sarcomatous, &c.	52	47	5
Glandular. Adenomatous	6	2	4
Cystic	14	9	5
Cartilaginous	4	—	4
Epitheliomatous. Cancerous	19	8	11
Not clearly indicated	16	14	2
Total	244	158	86

Papillomatous or Warty Growths, as will be seen by the above table, constitute a large proportion of the new growths met with in the larynx. In structure and appearance they bear a general resemblance to growths of similar nature found in other parts; they may occur either as little warty elevations, consisting of comparatively few, and sometimes almost acuminated papillæ, or as closely packed and multitudinous villous or filipendulous outgrowths, or as densely massed 'cauliflower-like' agglomerations of elongated and enlarged papillæ, rounded or flattened at their extremities. They most frequently, perhaps, spring from the mucous membrane of the anterior part of the larynx, somewhere near the insertion of the true vocal cords. In many instances, they take origin from the boundaries of the ventricles, and in some from the true vocal cords; but they may arise from almost any part of the laryngeal mucous membrane. As a rule, they

FIG. 258.



Papilloma of larynx springing from border of left ventricle. Larynx opened in front.

are multiple in origin, and spring up simultaneously or successively in several different places. Sooner or later, they more or less completely coalesce so as to form one or many distinct masses. Some idea of the general appearance presented by growths of this kind, may be conveyed by Fig. 258, which is taken from a preparation in the Museum of Guy's Hospital.* The growths in this case form a single mass, which cannot be considered as otherwise than of moderate dimensions when compared with those met with in many other instances. It was sufficiently large, however, to lead to a fatal result. In some cases these growths increase very rapidly, and to such an extent as to fill altogether, and sometimes even to distend the cavity of the larynx.

A very remarkable instance is recorded and figured by Bruns.† In another case of the same kind, of four or five years' standing, in which I removed the growths after having laid open the larynx, it appeared remarkable that such a mass as was removed could ever have found room in so small a space.‡ The laryngeal mucous membrane was literally covered by growths, which varied in size and density. The patient nevertheless made a rapid recovery, and has now a very fair voice.

In most cases the rapid increase of the growths, or the general inflammatory condition which may arise in association with their presence, and the consequent obstruction to respiration, render tracheotomy necessary, or without this operation, lead to a fatal result at a comparatively early period. But in some instances patients suffering from laryngeal growths of this kind have been known to live for years. In such cases, it is probable that the larynx has been kept sufficiently clear for breathing purposes by the detachment and expectoration of portions of the growth from time to time during coughing. Türck records a case in which the whole growth appears to have been thus got rid of.§

I have at the present time a little girl under my care in Guy's Hospital, whose trachea I opened three years ago on account of a growth of this kind, and with the view of subsequently removing the growth. The parents, however, objected to any further operation. The child's voice has improved, and the growth is now visibly smaller than it was two years ago when I previously examined her laryngoscopically. She cannot, however, dispense with the tracheotomy canula, although she is able to some slight extent to breathe through the natural passage.

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* Preparation No. 1703.

† Op. cit. Beobachtung viii.

‡ Tracheotomy had been performed about four years previously.

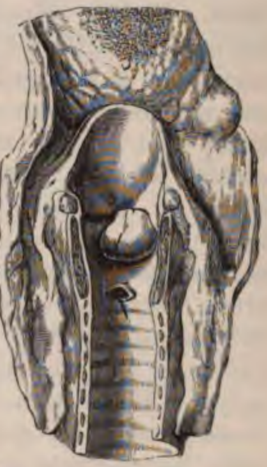
§ *Klinik der Krankheiten des Kehlkopfes.* Op. cit. Fall lxix. p. 305.

According to some observers, it would appear that these papillomatous growths occasionally undergo a process of pulpy or caseous degeneration.* In such case it is easy to understand that they may become broken down and expectorated.

Fibrous and Fibrocellular Growths are met with in the larynx much less frequently than the papillary growths above described, but numerous instances are on record.

These growths are smooth on the surface, hemispherical, globular, or pyriform in shape, and on laryngoscopical inspection they appear somewhat paler in colour than the mucous membrane of the surrounding parts. In substance they are more or less firm and compact. In structure, they resemble growths of similar nature developed in other parts; as a rule, they are solitary; they may be sessile with broad base, or pedunculated. If pedunculated, the pedicle is generally less firm and more vascular than the growth itself. In a large proportion of cases these growths are comparatively small, and do not each exceed the size of a pea; but they may attain considerable dimensions. In an instance referred to by Rokitansky, the growth was as large as a pigeon's egg.† A pedunculated fibrous growth of medium size is represented in Fig. 259, which is taken from a specimen in the Museum of Guy's Hospital.‡

FIG. 259.



Pedunculated fibrous polypus of the larynx arising near the anterior extremity of the right ventricle of the larynx.

The larger pedunculated growths generally take origin from one or other of the true vocal cords, or from some immediately adjoining part of the ventricular wall—and in the latter case most frequently near the anterior extremity of the ventricle. They may, however, arise in other parts of the larynx, but they very seldom do so; in scarcely any instance has a growth of this kind been found connected with the mucous membrane covering the arytenoid cartilages.

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* See M. Causit, *Étude sur les Polypes du Larynx chez les Enfants.* Paris, 1867.

† *Zeitschr. d. k.k. Gesellsch. d. Aerzte z. Wien*, 1851, quoted by Krishaber. Op. cit. p. 730.

‡ Preparation No. 1703^{20}. Tracheotomy had been performed in this case; and the patient had for a long time been comparatively comfortable, but voiceless. One day the tube got displaced. Spasm of the larynx, conjoined with the mechanical obstruction caused by the growth, proved immediately fatal.

Adenomatous or Glandular Growths are occasionally but rarely met with in the larynx. As a rule, they take origin from the mucous membrane covering the arytenoid cartilages, the aryteno-epiglottidean folds, or the base of the epiglottis,—or in general terms from those parts of the mucous membrane which are naturally most abundantly supplied with glandular structures. In this respect they differ remarkably from all other laryngeal growths of nonmalignant character. They consist essentially of enlarged and hypertrophied glands and follicles, surrounded by more or less thickened submucous connective tissue and mucous membrane. Occasionally they appear to contain adenoid structures of new formation. They may be sessile or pedunculated. When sessile (localised glandular hypertrophy of the mucous membrane), they often present a more or less lobulated appearance; and in some instances they attain very considerable dimensions.* When pedunculated they are usually more or less pyriform or globular, and their peduncles are proportionately longer than those of the fibrous polypi. When seen during life, by aid of the laryngoscope, these growths are generally of a deepish red colour, but they often become pale as they advance in age. They are remarkable for the rapid changes in volume they are liable to undergo under various circumstances. Thus a slight attack of catarrhal laryngitis is almost sure to be attended by speedy and considerable increase in the size of the growth, which may, however, again become smaller as the inflammatory condition passes off.

Cystic Tumours of various kinds are met with from time to time in the larynx; but instances are comparatively rare. In some cases they may possibly result from the degeneration and breaking down of myxomatous growths, as suggested by Cornil and Ranvier;* but more frequently, probably, they owe their origin to causes corresponding to those which lead to the development of similar cysts in other parts. In some cases their contents are serous, or serosanguinolent; in others mucous, albuminous, or synovial in character. They may occur in almost any part of the larynx, and in some cases have attained considerable size.†

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* See case quoted by Ehrmann. *Histoire des Polypes du Larynx.* Strasbourg, 1850.

An interesting, and I believe almost unique example of mucous cyst connected with the posterior aspect of the epiglottis, came under the care of Dr. Wilks and myself in Guy's Hospital some few years ago. The patient, a delicate boy eleven years of age, had suffered two years previously from a severe attack of sore throat, and ever since had experienced more or less difficulty in swallowing. This difficulty gradually increased. His voice soon became affected, and bye-and-bye he began to suffer from frequent and severe attacks of dyspnœa, which often came on during sleep. On laryngoscopic examination, the epiglottis was not to be seen presenting its ordinary form; but instead of it there appeared a large rounded swelling, projecting downwards and backwards, and completely covering in and concealing the glottis. The tumour was pale in colour, shining, and somewhat translucent in appearance. It could be just reached by the finger, and was elastic, but very tense to the touch. Feeling certain that it contained fluid, I made a free incision into it, by means of a curved, sharp-pointed bistoury. A sudden gush of thick, glairy, mucopurulent matter took place; and after the momentary dyspnœa which occurred had subsided, the patient was relieved of all the symptoms from which he had before suffered so severely. He made a rapid recovery, and ieft the hospital quite well. I examined him laryngoscopically four years afterwards (as well as from time to time in the interim), and could discover no indications of any return of the disease, nor indeed any very clearly perceptible mark of my incision.‡ A case of somewhat similar kind is recorded by Delorme, in which two cysts, with glairy albuminous contents, were found on the posterior aspect of the epiglottis of a man forty years of age, who died asphyxiated.§

It is worthy of remark, perhaps, that *true hydatid cysts* are stated to have been found in the larynx in some few very exceptional cases.‖

A few instances of *Cartilaginous and Osseous Growths* in the larynx are on record; but the accounts given, so far as I have been able to make out, are not altogether satisfactory.*

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* Quoted by Krishaber.

† See a remarkable case described by Gibb (op. cit. p. 154), in which the tumour apparently sprang from the right ventricle, and filled nearly the whole glottis.

‡ See *Transactions of Royal Med.-Chir. Soc.* Vol. xlvii. 1864.

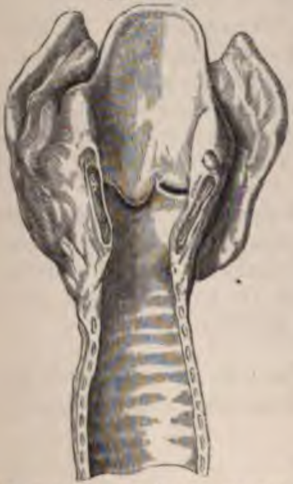
§ *Journ. de la Société de Médecine de Paris*, janvier 1808.

‖ Albers, *Gazette médicale*, fév. 1835; and Andral, *Anat. path.* Tome ii. p. 490, quoted by Ryland, *On the Diseases and Injuries of the Larynx*, Lond. 1837, p. 226

Besides the growths of the various kinds thus described, others of mixed form and character are occasionally met with in the larynx. Thus the fibrous, fibrocellular, and glandular elements may vary in relative proportion in such manner and to such extent as may render it impossible to assign the particular growth under examination to any definite class. And so again some growths which superficially appear papillomatous may have firm fibrous bases. And, further, the condylomata of syphilis, the thickened elevations of phthisis, and the small protuberances resulting from localised chronic inflammation in some cases can hardly be distinguished from what more properly, perhaps, ought to be regarded as 'new growths' in the strictest acceptation of the term.

A very interesting specimen was almost accidentally met with some short time since in the post mortem room at Guy's Hospital, in which there was extroversion of the mucous membrane of the left ventricle of the larynx. Fig. 260 conveys a somewhat feeble idea of the appearance presented. The extroverted mucous membrane could be easily replaced in its proper position; and when this was done there was nothing abnormal in the appearance of the larynx. The patient had had no laryngeal symptoms.†

FIG. 260.



Extroversion of the mucous membrane of the left ventricle of larynx, simulating laryngeal polypus.

Cancerous Growths in the larynx are for the most part *epitheliomatous* in character; but instances of *medullary cancer affecting the larynx* are not wanting.

Epithelioma of the larynx generally commences on the pharyngeal aspect of the mucous membrane covering the arytenoid or cricoid cartilages, and subsequently invades the interior of the larynx. But in some instances it commences inside the larynx; and in such cases, as a rule, it first appears on the mucous membrane of the posterior and lower part, over or near the internal surface of the cricoid cartilage, in the form of small irregular nodules, which gradually increase in size and soon ulcerate. Three instances of epithelioma commencing in this situation, and in the manner described, have come under my own observation. In each the precise position and character of the growth were recognised at a comparatively early period; and in each the result of the case established the correctness of the diagnosis. The distinctive features of advanced epithelioma of the larynx, as seen by aid of the laryngoscope, have been already described (see p. 562).

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* See Ryland. Op. cit. p. 231. *Edin. Med. Journ.* Vol. xxxv. Krishaber. Op. cit. p. 769. Türck. Op. cit. Fall lxxxi. p. 321.

† The case is fully described by Dr. Moxon, *Trans. Path. Soc.* 1868, p. 65. The preparation is in the Museum of Guy's Hospital. Preparation 1683.

The *symptoms* to which 'new growths' or 'polypi' in the arynx give rise vary in character and severity with the dimensions and precise relations of the particular growths under observation; and also with the intensity of the inflammatory condition which in many cases may be excited by their presence, or at any rate may be sooner or later associated with it.

Difficulty of breathing, alteration or extinction of the voice, cough, and, it may be (especially in the case of cancerous growths) difficulty of swallowing; these are the symptoms—as ndeed they are also the symptoms, varying only in intensity and urgency—in all serious affections of the larynx, as well as n some other maladies in which the larynx is only indirectly ffected. It is very rarely indeed, if ever, that any one of these ymptoms manifests such peculiarities as may be considered o indicate the presence of a 'new growth.'

In many cases when the patient first comes under observation he difficulty of breathing is so urgent, or becomes urgent so peedily, that tracheotomy must be performed before any exact iagnosis can be made. The difficulty of breathing may depend ither upon the mechanical obstruction caused by the growth, r upon spasm of the larynx excited by an incidental contact of he growth with some unaccustomed, or already irritated part f the highly sensitive boundaries of the glottis. A growth may exist for a long time almost harmlessly, moving in correpondence with the respiratory movements of the larynx, and hen all at once may get into such position as to excite the most severe attack of spasmodic dyspnœa. This is especially likely to occur in the case of pedunculated growths. It may occur in other cases, if from any cause an attack of ordinary laryngitis should supervene. Sessile growths by their gradual increase may gradually constrict the aperture of the glottis, and thus proportionately impede respiration, without giving rise, at least during their earlier stages, to any such suddenly serious and dangerous results as those thus indicated.

In the case of growths situated below the glottis it may happen that expiration is almost as much impeded as inspiration.

In some cases by means of the stethoscope placed over the larynx a sound produced by the movements of the growth during respiration (the 'bruit de drapeau' of the French) may be detected.

The voice is affected to a greater or less extent in almost all cases; and if the growths are small and situated on the vocal cords, the affection of the voice may be the only symptom of which the patient complains. The voice may be simply changed in tone and quality and become harsh; or it may have the 'cracked pot' or 'Punch,' sound; or it may be reduced to a hoarse whisper; or it may be altogether extinguished. In some exceptional cases the voice, at first seriously affected, has been noticed to improve to a certain extent with the increase of the growth.

In a considerable proportion of cases there is little or no troublesome cough. But if an attack of catarrhal inflammation should occur, the cough becomes especially distressing; and fits of spasmodic cough may be excited from time to time in any case in which a pendulous tumour is liable to get into obstructive position. Occasionally the patient becomes conscious of the presence of some cause of obstruction, and tries 'to cough it up.'

Slight mucous or mucopurulent expectoration may attend the cough; sometimes portions of the growths may be mingled with the expectorated material;* and, as already stated, in some exceptional instances considerable portions, and even the whole of the 'new growths' have been got rid of in this manner.

Among the various affections which may give rise to symptoms similar to those thus referred to as caused by the presence of new growths in the larynx, may be enumerated—chronic laryngitis with œdema; spasm of the larynx, from whatever cause; laryngismus stridulus; nervous aphonia; pressure upon the pneumogastrics or the recurrent branches by tumours, aneurisms, &c.; retropharyngeal abscesses; pharyngeal polypi hanging down or projecting into the larynx, &c. It is, however, in the present day altogether needless to discuss in detail the distinctive differences that may or may not be presented by the symptoms in these several affections. In all cases in which time and opportunity are at command the diagnosis may be readily determined by aid of the laryngoscope. In cases, however, in which the symptoms are very urgent, whatever may be their cause, relief must be afforded and safety secured by tracheotomy or otherwise before any full enquiry can be entered upon: laryngoscopic examination may then be made under favourable circumstances at any convenient subsequent period. It occasionally happens in the case of growths taking origin low down, that they almost disappear under the vocal cords or into the ventricles during inspiration, and only come thoroughly into view during expiration.

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* It may be interesting from an historical point of view, to quote the words of Ehrmann, writing in the year 1850:—'Il n'existe, il faut le dire, qu'un seul signe certain de l'existence de cette maladie; c'est l'expuition de quelques parcelles du polype.'—Op. cit. p. 31.

It is worthy of note that in some cases, particularly in children who are difficult subjects for laryngoscopical examination, valuable, if not conclusive indications may often be obtained by digital exploration. The effort at vomiting commonly excited during the introduction of the finger into the pharynx causes the larynx to rise momentarily, and thus to come within easy reach.

Treatment.—Measures should be adopted for the removal or destruction of all nonmalignant new growths in the larynx as soon as practicable after their presence and probable character have been clearly ascertained. For it may be asserted without fear of contradiction that no patient can be considered safe who has in his larynx a new growth of any considerable size—that is to say, unless his safety has been secured by tracheotomy. And small growths, as already stated, are liable to enlarge more or less quickly, and often unexpectedly; and even while still small they may favour the supervention of dangerous inflammation.

In some cases it is absolutely necessary, and in others it may be desirable, to perform tracheotomy before proceeding to any further operative measures. Very many cases, however, have now occurred in which, without tracheotomy, growths have been removed from the larynx, not only with the best ultimate results, but also without having involved the patient even temporarily in any serious risk.

The advisability of performing tracheotomy as a preliminary measure must be determined by the urgency of the symptoms, and the probable difficulties and dangers of the proceedings about to be carried out.

A great variety of different methods have been devised and adopted for the removal of growths from the larynx. They may be divided into those in which the operation is performed by aid of the laryngoscope through the mouth and natural passages, and those in which access is first obtained to the interior of the larynx by means of incisions in the median line through the skin, cartilages, &c.

The following table, compiled from published records of cases and the results of my own observations, may serve to convey some idea as to the relative frequency with which the different methods of operating specified have been deemed expedient, as well as the degree of general success that has attended the efforts hitherto made.

TABLE OF CASES OF OPERATIONS FOR THE REMOVAL OF NEW GROWTHS FROM THE LARYNX.*

Methods adopted.	Total number of cases.	Completely successful results.	Partially successful results.	Deaths.
A. OPERATIONS THROUGH THE MOUTH AND NATURAL PASSAGES:				
Direct application of caustics or powerful astringents . .	16	12	4	
Removal or crushing by forceps .	37	33	3	1
Removal or crushing by wire snare	32	28	3	1
Removal or destruction by the galvanocaustic wire or pencil .	5	3	2	
Removal by knife or scissors .	20	14	5	1
Simple puncture	4	4		
B. OPERATIONS AFTER EXTERNAL INCISION INTO THE LARYNX, ITS CAVITY BEING MORE OR LESS COMPLETELY LAID OPEN . . .	24	15	5	4
Total	138	109	22	7

The above table must be taken for what it may be worth. It certainly appears to indicate the methods of operating that have hitherto been found most successful. But it cannot for one moment be regarded as affording any trustworthy guide to the method that ought to be adopted in any particular instance that may come under observation.

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* In the cases specified as 'completely successful' the voice was restored. In those 'partially successful' the voice remained more or less impaired. In the

In deciding upon the course to be pursued, it is necessary in every case to take into consideration not only the size, precise situation, and character of the growth, but also the age, development, and condition of the patient, together with his general and special powers of endurance. If success is not attained by the method first adopted, another may tried. Several methods were put in practice in each of many of the cases included in the above table. But in every instance the case is referred to the method which finally proved successful.

A. Operations through the Natural Passages.

1. *The Application of Caustics and powerful Astringents* to growths in the larynx, may be accomplished by the several methods already described (see p. 529); in the case of small isolated papillary growths, such applications several times repeated, are not unlikely to prove efficacious.

2. Small fibrous, fibroid, and fibrocellular growths, and small or large papillary growths may, in many cases, be successfully seized by means of properly adapted *Forceps*, and either torn off and removed in mass, or so crushed as to lead to their destruction. In the case of multiple growths, the repeated use of the forceps is often necessary. Portion after portion may be removed either at the same sitting, or during a series of sittings at intervals, according to circumstances. This method is especially advocated by Mackenzie;* and the laryngeal forceps, which bear his name (Fig. 261), are, I believe, the most generally applicable, and therefore the best of all the instruments yet devised for such purposes. Forceps made upon the principle illustrated in Fig. 262 are also very efficient. Some of these forceps are made to open laterally, and others antero-posteriorly, like those represented in the figure. In some cases ordinary laryngeal forceps, such as those figured and described

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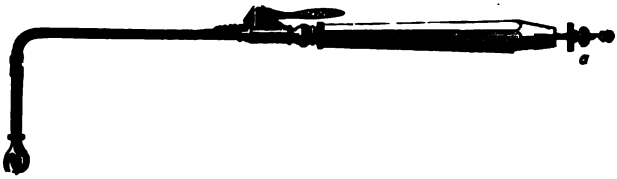
fatal cases, with two exceptions, the growths were epitheliomatous or cancerous in character.

in the chapter on Foreign Bodies in the Larynx (see Vol. II. p. 524) have been used with perfect success.

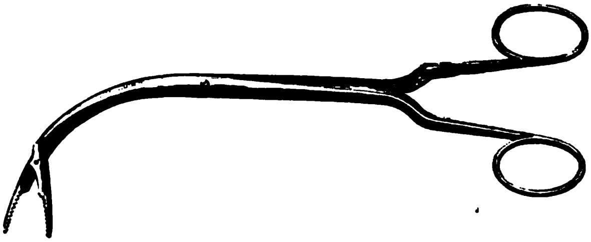
3. For the removal of laryngeal growths by *the Wire Snare* it is necessary to employ a slender and appropriately curved instrument carrying a wire loop, which can be quickly and easily drawn home when once it has been made to encircle the growth. The instrument successfully used by Dr. Walker of Peterborough in the first case in which a laryngeal growth was removed from the larynx during life in this country was a modification of Gooch's double canula.* But the double tube is cumbersome and altogether unnecessary. Gibb's 'Laryngeal Écraseur'† is a far more perfect instrument—indeed, nothing could be better adapted for its purpose, unless it be some such modification as that suggested by Dr. George Johnson.‡ These instruments bear a general resemblance in construction and mode of working to Wilde's Aural Polypus Snare, and Hilton's Nasal Polypus Snare (see p. 301, Fig. 230); but they are, of course, different in shape and more slender. In using this instrument the

FIG. 261.



Mackenzie's Laryngeal Forceps.

FIG. 262.



Laryngeal Forceps, opening antero-posteriorly.

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* See *Lancet*, November 9, 1861, p. 444.

† Made by Weiss; see Gibb. Op. cit. p. 138.

‡ See *Transactions Royal Med.-Chir. Soc.* Vol. li. p. 173 et seq.

wire loop is made to encircle the growth, and then pulled tightly home. The growth is then forcibly pulled or twisted from its attachment, and, as a rule, is brought away in the loop. This method is strongly advocated by Sir D. Gibb,* and Dr. George Johnson.† It is especially applicable in cases in which the growths project in such manner and direction as to render them easily caught, and in which they are soft or pliable in texture, and not very large.

4. *The Galvanocaustic Method* was first practised by Middeldorpf, and has since been adopted by Voltolini, Türck, Bruns, and others. It has been still more recently recommended by Dr. Reichel of Breslau.‡ This method consists in encircling and cutting off the growth by means of a platinum wire, which is so arranged in an appropriate carrier that when in position it can be intensely heated by means of a galvanic battery with which it is connected. The difficulties of this method are sufficiently obvious, and they, together with certain other practical objections to it, are clearly and forcibly stated by Bruns,§ after some experience of its use. Its advantages in certain cases are equally obvious; and it would appear to be especially applicable in cases in which single fibrous growths exist, the peduncles of which are too strong to permit them to be safely torn away by means of the snare or forceps. A touch of the heated wire may be sufficient to dispose of small papillomatous growths.

5. *The Knife*, properly curved and guarded, or the *Laryngeal Scissors*, may be used for the separation of firmly attached growths which may have been seized but cannot be pulled off by the snare or forceps. Such means were adopted in several of the cases successfully treated by Bruns.|| Several different forms of laryngeal guillotine have been devised. Of these Matthieu's is probably the best. It has been used with success in several cases.

6. *Simple puncture* by the guarded bistoury or some specially contrived instrument (such as Mackenzie's laryngeal lancet) has proved completely efficacious in several instances in which the growths were cystic in character; and in such cases this method

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* Op. cit. p. 138.

† Op. cit. p. 173 et seq.

‡ *Klinische Wochenschrift*, No. li. 1869. Berlin.

§ *Die Laryngoskopie und die laryngoskopische Chirurgie*, p. 244 et seq. Tubingen, 1865.

|| See Table, Op. cit. p. 254.

may be recommended. If in any case the cyst should fill again, it may be desirable on a second occasion to remove a portion of the cyst wall, or at least to make a more extensive incision than the previous one.

It is scarcely needful to add that all these several methods of removing laryngeal growths require during their execution the guidance afforded by the laryngoscope.

B. Operations for the Removal of Laryngeal Growths after Exposure of the Cavity by External Incision and Section of the Cartilages, &c. *

In cases in which the growths are numerous, or very large, or single but firmly attached, and in those cases again in which the patients are young, and ill able to bear the introduction of instruments through their narrow natural passages, there can be no doubt, I think, that the easiest, most certain, and at the same time the safest method of operating consists in laying open the cavity of the larynx by external incision, and then removing the growths by scissors, écraseur, or galvanocaustic wire. The results of experience † encourage the further and more confident adoption of this procedure in all such cases as those referred to. It affords opportunity for the more immediate, complete, and effectual removal of the growths than can be obtained in any other manner. It is by no means difficult of execution, nor does it involve any immediate risk. Such bleeding as may occur can be readily checked, for all the parts are fully exposed; and freedom of respiration may be secured by the preliminary performance of tracheotomy—if, indeed, this operation have not previously been rendered necessary.

A good illustration of the success attending this method is afforded by the case of a girl, thirteen years of age, under my care some years since in Guy's ospital. Tracheotomy had been performed four years previously on account the urgent dyspnœa from which she then suffered. On laryngoscopical amination, masses of warty growths were distinctly seen. These were moved by the scissors after exposure of the laryngeal cavity by section rough the thyroid cartilage, cricothyroid membrane, and other structures. itrate of silver was freely applied to the bleeding surfaces. The growths had cupied the whole cavity of the larynx. The divided parts were brought gether. The patient made a speedy recovery, and the tracheotomy canula hich she had worn for four years, was removed ten days after the operation. saw her the other day, three or four years after the operation. She was in od voice, and no appearance could be discovered of any recurrence of the owths.[*] In two other cases in which I have performed similar operations, the sults have been so far equally satisfactory.

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* It is worthy of note, that the first recorded operation of this kind was performed in the year 1844, by Ehrmann, who, without the aid of the laryngoscope (not then in use), diagnosed the existence of growths in the larynx from the symptoms and the appearance of portions in the sputa. He was justly so confident of the correctness of his diagnosis, that he boldly opened the larynx by median section, found the growths, removed them, and cured his patient. *Laryngotomie dans un cas de Polype du Larynx*; Strasbourg, 1844. Also, Op. cit.

† See especially the excellent treatise of Dr. Charles Planchon, *Faits cliniques de Laryngotomie*; Paris, 1869. In this treatise a large number of illustrative cases are given.

A remarkable case is recorded by Balassa of Pesth. The patient, a young oman, twenty-one years of age, had suffered from more or less difficulty of eathing, and had been aphonic for more than two years. On laryngoscopical amination growths in the larynx were seen. Balassa laid open the larynx by ction through the thyroid cartilage, and removed five portions of new growth. he patient made a good recovery, and her voice returned. Less than a year afterards, she again lost her voice, and experienced increased difficulty in breathing. alassa a second time opened her larynx through the thyroid cartilage in the tuation of the old cicatrix. Three or four portions of new growth were moved. The patient again made a good recovery; and as the result was together relieved of her dyspnœa, and regained her voice.[†]

In operations of this kind the thyroid cartilage and cricoyroid membrane, may be divided in the middle line probably ith impunity. But it is desirable to avoid, if possible, cutting rough or otherwise damaging the cricoid cartilage.

MM. Pratt and Follin have each succeeded in removing mours from the larynx after having divided the thyrohyoid embrane, and superficial structures by transverse incision.[‡] he objections to this method, arising principally from the ecessary section of the hyoidean muscles, as well as from the nperfect extent to which the cavity of the larynx is exposed, re sufficiently obvious.

In the case of epitheliomatous and other cancerous growths, would appear to be worse than useless to attempt removal, ithout first fully opening the larynx and exposing the whole xtent of the morbid structures. Whether any such attempt is stifiable the circumstances of the case must decide. As a general rule tracheotomy becomes necessary sooner or later; and it is probable that when once the character of the malady is recognised the earlier the operation is performed the better.

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[*] See *Guy's Hospital Reports*, 3rd series, vol. xii. p. 541.

[†] *Wiener medizinische Wochenschrift*, November 1868, quoted by Planchon. p. cit. pp. 62 and 79.

[‡] Pratt, *Gazette des Hôpitaux*, 1857. Follin, *Archives générales*, fév. 1867. uoted by Planchon. Op. cit.

NERVO-MUSCULAR AFFECTIONS OF THE LARYNX. NERVOUS OR FUNCTIONAL APHONIA. HYSTERICAL APHONIA. PHONIC PARALYSIS, &c.

Nervous, or Functional Aphonia.—Numerous cases come under observation from time to time in which the voice is lost, and in which also, more or less difficulty in breathing may occasionally occur, although no visible defect or disease can be discovered in the larynx itself on the most careful and complete laryngoscopical inspection. It may be seen that the several parts do not act properly, and that is all. Why they do not so act cannot be satisfactorily made out. Sometimes when the patient tries to utter a sound the glottis may be seen to remain widely open, and no sound is produced. Sometimes one of the vocal cords appears to come into proper position, the other remaining motionless, and apparently paralysed. Sometimes the vocal cords seem to approximate naturally at the commencement of the attempt to speak, and then separate without vibrating, as the air from the lungs is forced against them. Other odd phenomena may be observed by aid of the laryngoscope.

Alluding to cases of this kind, Sir Benjamin Brodie states* (and his statements are supported by general experience and observation):—

> 'This affection takes place suddenly, continues often for many months, even for one or two years, and then disappears as suddenly as it began. A patient thus affected may, when under the influence of strong mental emotion, find herself speaking in her natural voice, when for some time before she had spoken only in a whisper. Her recovery may be permanent, or she may relapse into her former condition. And again, this affection is not unfrequently met with in the male sex, especially in those of the clerical profession, probably because they often lead very sedentary lives, and also because they are called upon to speak in public in a tone raised above the ordinary standard.'

Cases of the kind under discussion are nowadays commonly classed as examples of some so called 'hysterical affection of the larynx,' although in many cases no other indications of hysteria are present. There can be no doubt but that in a very large proportion of instances the sufferers are either delicate oung women, or highly sensitive 'nervous' subjects of the ther sex. At the same time it must be admitted that the true athology and proper explanation of the affection are at present ltogether wanting. Türck[*] and Gerhardt[†] on the Continent, nd Mackenzie[‡] in this country have of late especially attempted o give precision and definiteness to our ideas respecting the bserved phenomena. They have also contributed somewhat o our knowledge of the determining causes of the affection, nd the treatment that should be adopted when it is fully stablished.

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* *Lectures on Certain Local Nervous Affections*, p. 51.

Sometimes the aphonia comes on as the result of exposure to old after extra exertion of the voice. In such case, as suggested y Gerhardt, it may be to some extent analogous to the facial aralysis due to *coup de vent*. Sometimes it appears to be simply he effect of fatigue and incapability for renewed effort. Someimes it remains after an attack of 'sore throat' has altogether assed off; and in such case it may be the effect of indisposiion, as it were, on the part of the muscles to resume those atural functions, from the performance of which they have een temporarily restrained by reflex sensibility. Sometimes, gain, the determining cause may be mental emotion, from the udden effect of which the nervomuscular apparatus of the arynx may have been unable to recover itself. But much nore frequently the explanation remains altogether undisovered.

The affection now under consideration must be carefully disinguished from those forms of laryngeal paralysis with aphonia r hoarseness which are due to the pressure of tumours, aneuisms, &c. upon the motor nerves of the larynx.

Treatment.—In some cases, and almost always in such as ppear to depend simply upon local indisposition to exertion esulting from the effects of exposure to cold, fatigue, &c., reovery takes place naturally after a certain period of rest. But n many cases, and most constantly, perhaps, in such as are nost obscure in their origin, the aphonia may remain persistent luring weeks, months, or even years; and then, either as the result of some accidental circumstance, or as the effect of treatment, the voice may be either suddenly restored or gradually recovered. Constitutional treatment of the kind indicated by the general condition of the patient is often beneficial. But in a very large proportion of cases, some local stimulus—some 'shake up' as it were—is necessary in order to set the nervo-muscular apparatus in action. Such local stimulus may be supplied in various ways.

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[*] Op. cit. p. 430, et. seq.

[†] Virchow's *Archiven*, vol. xxi.

[‡] *On Hoarseness and Loss of Voice in Relation to Nervo-Muscular Affections of he Larynx*; London, 1868. See also Lagarde, *De l'Aphonie nerveuse*, Paris, 1865; nd Krishaber. Op. cit.

In some cases the introduction of the laryngeal speculum, together with all the attendant formalities, is all that is required. Türck appears to have been the first to notice this 'method of cure' of aphonia.* Trousseau and Krishaber refer to several instances.† Three have come under my own observation. One of these may be worth mentioning, inasmuch as it affords an excellent illustration of the manner in which in cases of this kind the voice may sometimes be suddenly regained.

A young lady about nineteen years of age was brought to me by her friends, who appeared most anxious about her condition, believing that some very serious disease existed. I was informed that the patient had entirely lost her voice for more than six months, and that all sorts of treatment had been tried, but with no good effect, &c. After a great deal of persuasion, and very many abortive attempts, I at last succeeded in putting the laryngeal speculum into position. I then, in a matter of course tone, requested the patient to say '*Ah, ah.*' Pushing away my hand, she immediately and impatiently exclaimed, in fair natural voice, 'How can I, with that thing in my throat?' And then she added, 'Oh, dear! I've spoken!' It is almost needless to add that the cure was complete. But supposing that it had happened that some special method of treatment had been in process of application at the moment, what a marvellous cure this would have been!

In some cases the inhalation of strong stimulating or irritating vapours, as those of ammonia or chlorine solutions, proves efficacious; in others the application of solutions of nitrate of silver or sulphate of copper by means of the sponge, probang, or brush, is followed by restoration of the voice. This method of treatment found especial favour with Trousseau, who records many cases illustrative of the good results obtained.‡ It is not improbable that in some cases equally good results might be obtained by the introduction of an *unmedicated* sponge or brush.

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* See *Allg. Wien. med. Zeitung*, Feb. 21, 1860. Also *Clinical Researches on Diseases of the Larynx*, by Dr. Türck. Lond. 1862, p. 49.

† Trousseau, *Clinique médicale*, Tom. i. p. 585. Krishaber. Op. cit.

‡ *Clinique médicale*. Op. cit. Tom. i. p. 579 et seq.

Another method of treatment especially relied on by Mackenzie consists in the direct galvanisation of the vocal cords. This can be most easily and perfectly accomplished by means of Mackenzie's laryngeal galvaniser or electrode. There can be no doubt of the efficacy of this method. But—without any idea or intention of impugning for one moment the genuineness of the numerous examples from time to time published, in which cases of aphonia of long standing have been stated to have been cured by single, or by a few successive 'applications of galvanism to the vocal cords'—it may nevertheless be asserted that the application of galvanism possesses no *specific* virtues in such cases as those under consideration. It simply affords a convenient and very effective method of giving the necessary 'fillip' to the nervomuscular apparatus. Equally good results have been obtained by passing the interrupted current of an electromagnetic battery through the back of the tongue.

The method of treatment most recently advocated consists in manipulating (that is pinching and pressing backwards) the larynx; and many cases are recorded illustrating its efficacy.*

In conclusion, it may, I believe, be stated without fear of contradiction that the one thing especially necessary is, if possible, to surprise or startle the larynx into proper activity, and it matters comparatively little by what means this effect is accomplished. It must be borne in mind that in these affections there is no perceptible organic disintegration or wasting of the tissues. They appear to be sufficiently exercised for purposes of nutrition during their ordinary respiratory movements, which, as a rule, are carried on normally and without interruption.

Idiopathic Atrophy of the Muscles of the Larynx, and *Muscular Atrophy as the result of disease* are very rare affections. The examples that have at present come under investigation are so few that no satisfactory conclusions can be deduced.† It may be well, however, to bear in mind that such cases may from time to time present themselves.

In every case of aphonia, hoarseness, or other alteration of the voice, in which on laryngoscopical inspection one vocal cord only is found to be more or less completely paralysed, and in which, at the same time, the parts generally are natural in appearance, search should be made for some cause of pressure upon, or interference with, the motor nerves of the affected side of the larynx. If the vocal cord rests motionless during attempted vocalisation, attention should be especially directed to the recurrent nerve. If, however, the vocal cord is adducted and abducted more or less normally, but is not duly rendered tense, it may be that the superior laryngeal nerve, or rather its cricothyroid branch, is interfered with. Paralysis of the left vocal cord not infrequently indicates the existence of an aneurism of the arch of the aorta, or some intrathoracic tumour.

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* See H. K. Oliver, M.D., in the *American Journal of Medical Sciences*, April 1870.

† See Türck. Op. cit. p. 203. Mackenzie, *On Hoarseness, &c.* Op. cit. p. 71.

SPASM OF THE LARYNX. SPASM OF THE GLOTTIS.

Spasm of the larynx, attended by the most alarming and sometimes fatal dyspnœa, may arise from various different causes. Many such causes have been already discussed in the preceding pages. Others may depend upon the effects of injuries, or the introduction of foreign bodies into the airpassages (see Vol. II. pp. 458—478, et seq.). Others again may depend upon the irritation produced by the pressure exerted upon the laryngeal nerves by aneurisms or tumours, whether they be 'new growths' or simple enlargements of some natural organs, as the thyroid body, lymphatic glands, &c, and whether situated in the neck, or within the thorax. Intrathoracic tumours pressing upon the trachea or bronchi by some reflex nervous influence, and hysteria, tetanus, and certain cerebral affections in some manner altogether inexplicable, may also give rise to spasm of the larynx.

However difficult it may sometimes be to ascertain the cause, the symptoms of this formidable affection are always unmistakeable.

Treatment.—If the spasm does not very quickly and very completely subside under simple treatment—and even in absence of all satisfactory explanation of the cause of the attack—tracheotomy should be performed without hesitation. There is far more danger in waiting too long than in operating too soon: and whatever the result, the conscientious surgeon may always feel assured that it is better to have made an unnecessary incision into the windpipe than to have allowed his patient to die for want of one.

ARTHUR E. DURHAM.

DISEASES OF THE INTESTINES.

ABDOMINAL ABSCESSES.

BSCESS originating in the substance of the anterior abdominal wall, or in the sub-peritoneal cellular tissue, in e region of the loins, or pelvis, and totally unconnected with sease of bone, or with ulceration of the bowels, is not a very mmon occurrence; but as we occasionally meet with such a se, it is requisite to allude to its peculiarities and treatment.

An abscess confined to the substance of the muscular parietes most frequently the result of a bruise, and may be treated as scess in any other position. But one commencing in the llular tissue of the loin, or iliac region, is generally obscure the commencement; frequently produces much constitutional sturbance in its progress; and is very often fatal in its results. scesses occurring in these situations are sometimes slow in mation; but in other instances form with great rapidity, d acquire a large size within two or three weeks. According the rapidity of their progress will be the acuteness of the mptoms which accompany them. They are as frequently seen children as in adults. Without careful examination, they y be readily mistaken for psoas abscess dependent on diseased rtebræ, or for some kind of tumour growing in the cavity of e abdomen. In children, from the resistance of the abdonal and psoas muscles, and the drawing up of the thigh on e belly, disease of the hip-joint might be suspected, if the nditions be not particularly examined into.

very sickly child was admitted into the Hospital for Sick Children, under care of Sir W. Jenner, with a large prominent roundish swelling on the left , between the region of the kidney and Poupart's ligament. There was very le indication of pus, or fluid, in the swelling; its shape and consistence veyed the impression that it might be a malignant growth. As some doubt sted as to its character, a fine trocar was passed into it by the writer, and e thick pus immediately escaped through the canula. A small opening was n made through the parietes into the abscess, and allowed the free escape of medical attendant may be daily watching for an opportunity to give exit to pus at some favourable point, the swelling may suddenly subside, and disappear by evacuating the contents, through some fresh opening, into the bowel, the pus being discharged per anum.

When of an acute character, the symptoms of a 'fæcal abscess' are very marked. Sudden pain is referred to the part affected, often of a very severe character; constipation often anticipates the attack, or accompanies it. The pulse and tongue sympathise early in the mischief; the former becomes rapid; the latter loaded and creamy, and soon dry and brown. There is often great anxiety and restlessness; much thirst, and a hot dry skin. There is very frequently, early in the attack, distinct fulness of the part implicated; and, in addition to extreme tenderness and an intolerance of pressure, general indications of diffused peritoneal inflammation. The most frequent seat of such abscesses is the region of the ilio-cæcal valve—the right iliac fossa; but they may occur in any part of the abdomen.

Sometimes the formation of pus is so rapid, and the mischief in the peritoneal cavity is so general, that the patient dies within a few days of the first symptom of pain. Mr. ——, late House-Surgeon of St. George's Hospital, while walking in Hyde Park, was suddenly seized with excruciating pain about the right iliac fossa. Though but a very short distance from his lodgings, he was obliged to be carried home. When seen by the author in the evening, there was intense pain in the right iliac region, with a certain amount of fulness, and great tenderness on pressure. The skin was hot; the pulse rapid, and there was great anxiety of countenance. The symptoms were in no way relieved by the treatment prescribed in consultation with the late Dr. Bright. The case proved fatal in a few days. On examination after death, a large abscess was found to occupy the right iliac fossa; the boundaries were formed by adhesions of the intestines and the parietal peritonæum. The contents were pus and fæces. The appendix cæci was found ulcerated through at its extremity. No solid substance could be found, to account for the ulceration by its pressure or in any other way.

It is desirable to note that when abscess is the result of an ulcer perforating the wall of the cæcum, much will depend on the exact seat of that ulcer; viz., whether it be in the part covered by peritonæum, or on the posterior surface where the intestinal wall is in contact with cellular tissue. In the former instance, such an abscess is frequently rapidly fatal from the immediate effects of acute peritonitis: or adhesions of the opposed peritoneal surfaces may have occurred prior to the perforation, and the abscess become limited by such adhesions, and after a time present externally; the patient then has more chance of recovery after the evacuation of the pus. In the other instance, in which an abscess is the result of perforation of the posterior wall of the intestine, and the escape of fæcal matter into the cellular tissue, the abscess is less apt to be limited; and matter often burrows in a variety of directions.

A woman lately admitted to St. George's Hospital under the author's care, had extensive suppuration and numerous sinuses with various openings in the right groin and on the outer surface of the right ilium. These were freely laid open, but she gradually sank exhausted. On examination after death, a circular smooth-edged small opening was found in the wall of the posterior surface of the cæcum, communicating with a large abscess in the right iliac fossa, and with numerous sinuses running in various directions. The ulceration appeared to be due to an attack of fever.

Occasionally an abscess in this neighbourhood is much more tardy in its progress; and although matter continues to collect, the patient, having passed over the first acute stage of the attack, may soon improve in health and appetite; the general tenderness of the abdomen, or distension of the bowels—should either have existed—commences to subside; and a local swelling remains in some portion of the abdomen, marked by external fulness, and often by a well-defined surrounding wall. The skin over this part becomes more red and shining than that of the immediate neighbouring surface; then darkens in colour, and becomes thinner at one or more spots; and either ulcerates or is punctured, when pus readily escapes.

It is a safe and very judicious proceeding to open such an abscess, as soon as it may be suspected to have formed, and to be within reach of the knife. If the incision be delayed until matter makes its approach towards the surface, it will generally happen, during this process towards self-liberation, that the pus works its way in several directions; it has been so long kept back by the resisting action of the abdominal muscles and fasciæ, that it has burrowed wide and deep: so when the external opening has been long postponed, by nature or the surgeon, we find, in addition to the suppurating cavity in the iliac region, that the abscess has passed under Poupart's ligament and among the adductor muscles of the thigh, or deep into the pelvis, and may present itself in the perinæum, or has even opened into the rectum or vagina. We can never define what bed these abscesses may form for themselves, or how, when, or where they will discharge their contents. If one be opened late in the progress of the case, long sinuses will often be found, which lead from the opening in the abdominal wall to the surrounding parts, and thus render the ready escape of matter difficult. Under such circumstances, after a time, other collections of matter point, either in the groin, in the thigh, or about the ischiatic rami. Many a patient will, however, sink soon after the opening of a fæcal abscess: not only has he to contend against the effects of profuse discharge, but he has also the extra evil of a too ready and early escape of intestinal contents from the opening in the bowel.

Notwithstanding the severity of such cases in their general aspect, and the frequently fatal results they entail, we occasionally find a patient gradually recover, as it were, from a bed of death, and after he has endured the opening of a great number of consecutive abscesses; the sinuses slowly contract; the discharge diminishes by degrees, and ultimately ceases; and the orifices of the abscesses cicatrise one by one. The patient, however, recovers with a crippled limb, as a general rule. The suppurative action usually implicates the psoas and iliacus so much, and often the adductor muscles, that the movements of the thigh are subsequently restricted, nor can the limb be extended to its natural limit.

The general treatment of this class of cases is not to be laid down as simple, nor conveyed in a few words. It depends entirely on the course of the case.

In the early stage, *i.e.* of pain, constipation, and fever, constitutional measures and local treatment must be combined. Opium internally, and hot fomentations, perhaps leeches, externally, are usually most beneficial at first. Opium may be given in full doses, and often repeated. It may be requisite to combine small doses of calomel with it. Purgatives, as a rule, should be strictly avoided. Under the influence of opium alone, or combined with calomel, the bowels will act as early as their condition will permit; and quite soon enough to answer nature's purpose, *if they will act at all,* without the aid of purgatives.

When the patient survives the shock of the attack of inflammation, so soon as matter is suspected, the part should be explored, and, if possible, the pus let free. Under the influence of chloroform alone, can a satisfactory examination be made, in a case such as we are now considering; and we would, under all conditions which indicate, though they do not absolutely prove, the presence of pus, urge the use of chloroform, that a thorough examination may be instituted, and exploration made if deemed advisable.

Great attention and care in treatment is necessary, as soon as the pus has an outlet. Strict cleanliness is requisite, to prevent excoriation from the discharge, and also to avoid bed-sores. As the discharge is often extremely offensive, the chamber becomes insufferable, if not constantly and carefully ventilated. A free use of disinfectants is requisite in the room, as well as in the local dressings. A constant and liberal supply of nutritious food and stimulants are wanted to meet the wasting and lowering effects of profuse secretion from the abscess. It is often surprising to observe the quantity of wine patients require, and will take with impunity, under these conditions. The bowels must be carefully watched; they are often apt to become relaxed, and this diarrhœa, if unchecked, tends to reduce the patient. If collections of matter should point in other parts, they ought at once to be let out; or if superficial sinuses lead from one abscess to another, they should be slit up.

The usual conditions found after death, in cases of fæcal abscess, are general adhesions of the intestines and viscera in the immediate neighbourhood; some portions of which may form the boundaries of the abscess-wall. The communication with the intestine is generally very clear; often several may be observed; but when more than one exists, the others are commonly the result of ulceration *from* the abscess *into* the gut.

Most commonly the mischief which produces fæcal abscess, independent of cancer, arises near the ileo-cæcal valve: ulceration of the appendix is one of the most frequent causes.

In the *Transactions of the Pathological Society* (vol. vii. p. 210) is recorded a case in which perforation of the cæcal appendix was occasioned by the impaction in it of an intestinal concretion. Another case is detailed (vol. xii. p. 85), in which a fistulous orifice in the abdominal parietes opened into a circumscribed cavity, which communicated with the interior of the colon and duodenum, and indirectly with the gall-bladder. This was probably the result of a gall-stone ulcerating into the duodenum, and accidental rupture of the colon.

Fæcal abscesses and fæcal fistulæ occur in other parts of the abdominal wall; they are most frequently connected with the large intestine, and are generally the result of some cancerous obstruction, attended by ulceration of the bowel above, which, extending to the integuments, allows a partial escape of fæces.

A case of fæcal abscess and fistulæ communicating with the cæcum, caused by cancerous disease of the large intestine, is recorded in the *Transactions of* *the Pathological Society*, vol. i. p. 265; another, of abscess in the abdominal walls in connection with cancer of the stomach, vol. xi. p. 122; and a third, of fistulous openings through the abdominal parietes communicating with the transverse colon and stomach, the result of cancerous disease, vol. viii. p. 221.

The treatment of fæcal fistulæ dependent on cancer does not call for much remark. The patients often linger much longer than might be expected, provided they can take plenty of nourishment; but they often succumb much more rapidly than is anticipated by those in attendance: it is therefore best to warn the relatives of the sufferer of the possibility of sudden collapse in this disease.

INTESTINAL OBSTRUCTIONS.

The causes of intestinal obstruction are so various; its occurrence is fraught with so much danger; its symptoms are so severe and distressing; its diagnosis is so obscure; and its treatment so uncertain, and so often unsuccessful, that it is with the greatest diffidence we undertake the consideration of such an important subject as the pathology and the symptoms of intestinal obstructions, and the measures to be employed for their relief.

In entering upon an inquiry beset with so many difficulties, it has appeared to us a very important point, at the outset, to endeavour to classify the causes of obstruction, so that, in some measure, we may be able to determine, according to the symptoms, whether the obstruction depends on an acute strangulation entailing great and imminent danger to life; or on a slowly altered condition of the intestine itself, or of the adjacent tissues. Under the first condition the treatment must be decided; and to prove effective, must be early applied. In the second, there is generally more time to consider the prospects of life, and the advantages of interference. In the first, without prompt and entire relief, death generally follows rapidly in the wake of the onset of the symptoms. In the second, while we are calculating our measures, the symptoms may even subside; and their sudden cessation be followed by perfect recovery.

We therefore propose to divide the causes of obstruction into, 1st, those we may term sudden; such as are productive of acute and rapidly fatal results, if not presently relieved: and 2nd, those more slowly acting; productive of symptoms, chronic when compared with the first; and such as sometimes subside with the aid of medicine alone, or even occasionally without it.

Those which generally produce most acute symptoms, early in their attack, sudden in their nature, and rapidly fatal in their results, comprise,

1. Congenital strictures, or malformations.
2. Foreign bodies impacted in the intestines, and introduced through the stomach; formed in the gut; or escaping, by ulceration, from the gall-bladder.
3. Twisting, or 'dislocation,' of the bowel—most frequently observed in the large, but often in the small, intestine.
4. Loops, formed by bands of false membrane, adherent at both extremities; by diverticula, adherent by their apices to some portion of the viscera or abdominal wall; or by the fimbriated processes, or other portions of viscera, contracting adhesions, so as to form rings, or apertures, for intestine to become entangled in—all these usually the result of peritoneal inflammation.
5. Mesenteric pouches; foramen of Winslow; or 'thickened peritoneal sheaths,'* the result of old herniæ.
6. Invagination—often caused by worms, intestinal polypi, &c.

It is hardly necessary to mention, that all forms of external hernia are excluded in this consideration.

The more slowly acting processes productive of obstruction, in which the symptoms are at first not urgent, and in which relief sometimes occurs without assistance, and occasionally when all hope of life may have vanished, are—

1. Constipation, habitual or accidental.
2. Inflamed, thickened intestine, the result of injury.
3. Chronic peritonitis (tubercular) and abscess.
4. Tumours pressing on the bowel—hydatids, &c.
5. Simple stricture of intestine, the result of ulceration and other causes.
6. Cancer of the bowel, producing contraction of the gut.

Although we have divided these usual causes of obstruction into two classes, each productive of its peculiar train of symptoms and effects, one of the acute character, the other of a chronic nature, yet it must be clearly understood, for it will certainly be found so in practice, that this division must only be taken as a mere outline map of the difficult country we have to explore;

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* Rokitansky's *Pathological Anatomy*, vol. ii. p. 59.

that in many cases the symptoms may subside from the acute into the chronic, or from a quiet state become very severe. It must not be taken as a fact in every case, that acute symptoms cannot, or do not, depend on any one of the latter causes of obstruction; or a more chronic state of symptoms on any of the conditions noted in the first division; but as a general rule, we may venture with some degree of assurance to assert, that the several symptoms which will mark the cases coming under our first division are urgent, acute, and rapidly result in collapse and death, if not relieved by nature or art; while the greater number comprised in the second division are attended by symptoms which come on by degrees, may last many days, often weeks, or even months in some cases; are generally by so much the less urgent than the former in character, and permit of delay in treatment as regards surgical interference; allow time for consultation; are often capable of medical relief; and, if surgical treatment be considered requisite, offer many more features favourable towards the prolongation of life, than do the acute cases of obstruction. It must be borne in mind, that constipation, or entire stoppage of defæcation, is not an absolutely requisite symptom to indicate fatal obstruction of the intestine; nor, in suspected organic obstruction, should we presume to say that the disease has yielded to our treatment, even though diarrhœal action of the bowels comes on; it will probably last but for a short time, or the quantity of fluid passed will be small in proportion to the frequency of the motions. A relaxed state of the bowels in stricture is usually indicative of ulceration, and may occur, in old contracted stricture of the intestine, within a very short period of death.

1. Congenital malformations of the intestinal canal, giving rise to immediate obstruction, are almost entirely confined to the rectum and its external aperture. These deformities, and their treatment, will be found described in the essay on THE SURGERY OF CHILDHOOD, and therefore require no further notice here.

Another, but very rare condition of stricture, has been occasionally found in the duodenum of infants; the two following cases illustrate these structural alterations.

A child, when born, presented no unusual symptoms for the first twenty-four hours; vomiting then came on, and continued, with short intermissions, until death, which took place some thirty-eight hours after birth. The bowels were never relieved during life. The only disease found was a stricture of the duodenum, close to the entrance of the gall-duct; so that a probe passed down the latter entered the duodenum immediately below the constriction. There was nothing to indicate in what manner the constriction had occurred. On the gastric side of the latter, the duodenum was immensely distended; so much so, that at first sight it appeared like the pyloric end of the stomach itself; and only by a more careful examination was the distinction between the stomach and intestine detected, by a ridge running around their place of junction.*

A child eighteen months old was admitted into the Hospital for Sick Children, under the care of Dr. West, apparently in much pain; constantly whining, restless, and throwing about her legs and arms. The mother had noticed that the child vomited frequently, rejecting everything she took; there was considerable constipation. The child died in a few days.

The stomach presented a constriction, beyond which was a pouch which looked at first like the stomach, but ended sharply at a spot where there was a fold of mucous membrane; beyond this followed intestine of ordinary character. A probe inserted into the bile-duct, from without, passed between the two surfaces of this septum, and appeared just below the stricture. The pouch was detected to be duodenum; and what appeared to be a fold of mucous membrane at the further end of the pouch, proved to be a septum stretched with a slight obliquity, across the calibre of the bowel. The septum was perforated almost exactly in the middle, by a small hole nearly circular, and with a smooth edge. The valve possessed all the ordinary characters of intestinal mucous membrane.†

These strictures, so similar in position and in anatomical relations, were probably the result of an abundantly developed valve of the duodenum; that in the second case becoming more obstructive as the infant grew, on the principle that orifices in membrane or soft tissues, the result of diseased action, generally acquire a tendency to contract towards their centres.

Such cases are interesting, but are quite beyond the reach of treatment.

2. Obstructions, the result of foreign bodies lodged in the intestines, have already been considered in the essay on INJURIES OF THE ABDOMEN, Vol. II. pp. 465 et seq.; we merely allude to them to complete the causes of obstruction in our table.

3. Twisting, 'dislocation,' or displacement of intestine, producing obstruction to the passage of its contents, is not a very common accident, but demands very careful examination when it occurs: for not only is its origin peculiar and its symptoms

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* *Pathological Trans.* vol. xii. p. 101. From the plate which accompanies the description given by Dr. Wilks, it would appear that the contraction in all probability arose from a highly developed valve of the intestine; in the centre of this valve or stricture, may be seen a very small circular hole, apparently not larger than would admit a probe.

† Ibid. vol. xii. p. 121.

often obscure, but its treatment is a matter of very great consideration.

'Incarceration may be the consequence of a rotatory movement, and of this there are three varieties:

'*a.* A portion of intestine may have become twisted upon its own axis; and we then find that even semi-rotation causes such an approximation of its parietes, that they touch, and close up the passage. This can probably only occur in the colon; and according to cases on record, only in the colon ascendens. Accumulation of gas, and unequal filling of different portions of the intestine, appear, as far as we are able to judge from the few cases which have been noticed, to be the cause. Such an occurrence is scarcely conceivable in the small intestine, on account of the uniformity of its calibre, the absence of angular flexions, and its loose position, as every rotation of one portion upon its axis would be counterbalanced by the rotation of the next segment.

'*b.* The mesentery may be the axis, and the intestine will then be rolled up upon the former; *i.e.* the entire mesentery, or a portion of it, is twisted into a cone; and in proportion to the number of its rotations, more or less of the intestine will be dragged after it. In this case, we must take into consideration the traction and the pressure which the dependent mesenteric cone forms with the base whence its point rises. This variety can scarcely occur anywhere but in the small intestine and its mesentery.

'*c.* One portion of the intestine, either single or double—a coil—may afford the axis round which another portion with its mesentery is thrown, so as to be throughout in contact with the circumference of the axis, and thus to compress it like a ferule. This variety is evidently a higher degree of the first, in which a portion of the intestine is merely compressed from before backwards, and, as it were, flattened down. A coil of small intestine, the sigmoid flexure, or the cæcum, may form the axis.

'The last two varieties occur, like the first, chiefly at an advanced period of life. In early life, a predisposition to the affection may be caused by a congenital malformation of the mesentery, by large herniæ, or by small herniæ when there is adhesion of the intestine.'*

It is a matter of some importance to be reminded of, that the seat of *most* incarcerations *and of all twists*, will be found towards the posterior unyielding wall of the abdominal cavity; for it is only in that direction that pressure exerted on the intestine can effect its incarceration; the occurrence of a similar relation anteriorly is inconceivable, on account of the smoothness and yielding nature of the parts.

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* Rokitansky, *Pathological Anatomy*, vol. ii. p. 52.

The symptoms of twisting of the intestine, especially of the sigmoid flexure (which is the most common variety), are very urgent from the first; great pain is suddenly experienced in a small circumscribed spot of the abdomen; obstinate constipation usually setting in from that date. If the sigmoid flexure is implicated, there soon follows very considerable distension of the abdomen, often distinctly observed to be chiefly confined to the left side. The distension of the abdomen is generally much greater when the large gut is affected, than when the twist implicates the small intestine. In the latter conditions, fluids may be injected into the rectum very readily, and may remain, or return tinged by fæcal matter. In twists of the sigmoid flexure, we have injected fluids into this division of the bowel; if retained for a time, they do not return; the fluid has been thrown into the dilated sigmoid portion, and cannot again escape; vomiting is generally present, and often very copious and constant.

The following cases illustrate the history and pathological conditions of these accidents.

A man, aged twenty-eight, having suffered for five days from irremediable constipation, died five hours after admission to the Hospital-ship *Dreadnought*. The sigmoid flexure occupied nearly the entire portion of the front of the abdominal cavity, and was in a gangrenous state. The bowel was immensely distended; obliteration of the muscular bands, and rupture of the serous coat, having taken place. This portion of the gut had been originally highly developed, and had now become strangulated, from falling over on itself towards the right side, causing a twisting and strangulation. The patient had, on previous occasions, been subject to constipation.*

A man, aged sixty-five, was admitted into St. George's Hospital with a large circumscribed swelling, which occupied the greater part of the abdominal cavity, and apparently extended into the pelvis. Fluctuation could be distinguished over the whole of the tumour, the surface of which appeared smooth. No solid matter could be detected in any part of it. Percussion gave a clear sound in the upper part of the abdomen only, and there but to a small extent. *There was a tendency to diarrhœa.* A day or two after admission, peritonitis came on, with great pain in the abdomen and constant sickness. He died on the fifth day. The greater part of the peritoneal cavity was occupied by a large dark-coloured tumour, which had displaced the various viscera, and encroached upon the chest. This mass was formed of the sigmoid flexure enormously distended. The dilated bowel was connected to the left iliac fossa by a pedicle formed by an exuberant meso-colon, which was twisted upon itself, and had thus occasioned partial obstruction of the gut : the communications respectively leading into the colon above, and the rectum below, being small and tortuous. The sigmoid cavity was distended with fluid fæces, and contained one or two hard masses. The mucous membrane was of a dark livid colour, but not ulcerated. Extensive evidences of peritonitis were present.

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* *Pathological Transactions*, vol. i. p. 103.

A man, aged fifty-five, was admitted into Charing Cross Hospital, nine days after almost complete obstruction of the bowels. A displacement of the bowel implicated the termination of the ileum, cæcum, and ascending colon. The latter was pressed upon and strangulated by the termination of the ileum and its stretched mesentery. Just at the part where the pressure was exerted, a gland in a calcareous state, as large and hard as a marble, lay immediately under the strangulated bowel, and had considerable influence in exaggerating the obstruction, as every effort to force the contents of the gut onwards tended to carry the gland into the opening. Close above the constriction the internal coats were extensively ulcerated, and perforation was about to take place. In this case an attempt was made during life to relieve the obstruction by operation in the left loin, but without success, as the obstruction was above the opening made in the bowel.*

A boy was seized with a violent pain in the stomach, and with sickness. These symptoms continued, varying in intensity, with complete constipation. He died on the ninth day. The intestines were matted together. The duodenum, jejunum, and ileum were greatly distended ; the lower part of the small intestine was highly inflamed, and two loops of it were quite black from congestion. The mesentery of these loops had been twisted on itself, and had caused strangulation of the gut attached ; and while in this state, the folds had fallen on an intestinal diverticulum proceeding from the small gut to the linea alba, about one inch below the umbilicus, and thus gave rise to an additional amount of mechanical obstruction to the circulation and contents of the bowel.†

These cases are apt illustrations of the usual forms of 'twist' of the bowel, such as occur, 1, in the sigmoid flexure ; 2, about the cæcum ; 3, of the small intestine. As a rule, such twists, when found in the small bowel, are usually nearer its lower than its upper extremity.

Rokitansky has very justly observed that the *predisposition* towards incarceration from twisting of the gut is dependent on a congenital, or acquired long, loose, flabby mesentery or meso-colon. But the mere existence of such a state, which allows very free movements of the bowel to take place, is hardly sufficient to account for sudden strangulation of the parts taking place. It appears to us that something is requisite to establish the twist ; and that this something is to be found in an accumulation of fæculent matter, invariably present wherever such twists occur. This accumulation of fæces, fluid or solid, so loads and distends the bowel, that if accidentally it becomes shifted into a position unfavourable for the free passage of its contents, the intestine has no power to recover itself; nor has its peristaltic action any influence in altering its position, or that of the contained fæces. The mischief once started continues to increase by continued inlets of fæculent matter, without any corresponding outlet; for it will frequently be seen that though fluid fæces from above can enter the sigmoid flexure when twisted, it rarely happens that much is able to escape into the rectum.

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* *Pathological Transactions*, vol. ii. p. 222. † Ibid. vol. vii. p. 205.

If, in the dead subject, the large intestine be distended artificially with water, and the mesentery of the sigmoid flexure be abundant, this portion of bowel is first seen to bulge forward, and then gradually rise up towards the diaphragm. In this movement there is a slight tendency observed towards a folding of the intestine on its mesentery; this when the abdomen is open, and no restriction applied to the bowel. We have not, however, been able, by simply distending the sigmoid flexure, to produce actual twist; but perhaps our experiments are too restricted; and no doubt some other cause is wanting to induce it besides distension and free movement. Something, perhaps, depends on the motions of the body, more perhaps on the presence of the other viscera and abdominal wall during life. The following particulars of a case bear strongly on this portion of our subject.

A man, aged forty-five, was attacked on the 10th of November with diarrhœa. This ceased on the 12th. On the 13th he was occasionally sick, and complained of deep pain in the region of the bladder; and this pain became paroxysmal and severe until his death. Along the whole of the left side an unusually hard and broad ridge could be felt, extending from the region of the stomach to the bladder. Death took place on the 15th, almost suddenly.

The peritonæum contained a considerable quantity of bloody serum. In the epigastric region was seen the transverse colon, with the omentum stretched and adherent to the abdominal parietes, on the left of the umbilicus. The left side of the abdominal cavity was entirely occupied by the sigmoid flexure of the colon; it lay obliquely, and had forced the diaphragm high into the chest. The meso-colon, which was greatly thickened and elongated, had become twisted on itself, and the intestine with it. The gut was enormously distended by fluid fæces, and was livid, from almost complete strangulation of its coats and vessels at the seat of twist. Mr. Gay, under whose care this case fell, found on examination that, in the state of tension, if the bowel was partly untwisted and then relaxed, it sprang back forcibly to its acquired and altered position; but that this tendency became less as the bowel was gradually emptied of its contents, until it required little manipulation to restore the bowel to its natural position, and this without any marked disposition to again become twisted. He very justly remarks, *that usually the tightness of the twist is in proportion to the distension of the bowel.*[*] A tube passed up the rectum after death in this case was with some little trouble introduced into the sigmoid flexure, beyond the obstruction, and could empty the bowel. When this was effected, and the body rolled over on the side, the twisted bowel righted itself.

The facts just quoted point to this rule in treatment, that relief in twist of the sigmoid flexure is just possible without opening the abdomen, provided the long tube can be introduced into the distended gut, its contents drawn off, and the twist be reduced by the altered position of the bowel. But no operation for the ultimate relief of the patient will be successful, without the intestine be unloaded first, and the twist then reduced. It may be stated as an axiom in these cases, that once formed, the twist prevents the escape of the contents, and the contents of the twisted portion maintain the distortion; and to remedy the latter, the contents must be removed.

It will be observed that in one case already mentioned,[†] the serous covering of the intestine was found ruptured, after five days of constipation. This rupture had no doubt occurred previous to death. In an experiment made to distend the large intestine with water, the peritoneal coat in several places ruptured, before the muscular appeared inclined to give way under the pressure. This rupture of the peritonæum appears usually to commence over the transverse colon, and other portions are subsequently affected if the distension is continued.

This tendency of the peritonæum to rupture in sudden distension of the bowels, in cases of obstruction, points towards the importance of early interference, if any operation be considered beneficial. When peritonitis has set in, in consequence of rupture of the serous membrane, or any other cause, operative interference would probably be too late to hold out any prospect of success.

4. Obstruction of the intestines occurs from a portion of bowel being strangulated in a loop, or bound down by a cord of false membrane; or it may be constricted by a diverticulum, adherent by its apex to some opposed surface of the viscera; or by the Fallopian tube, attached by its fimbriated process to some point of peritonæum; or by a thickened and elongated piece of omentum fastened down at the ends by adhesions; or by other accidental circumstances. All these conditions

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[*] *Pathological Transactions*, vol. x. p. 153.

[†] See the first case on p. 603.

favourable to the occurrence of internal strangulation, are entirely or partly the results of inflammation and effusion of lymph.

5. Peritoneal pouches, which have usually well-defined rings for their orifices, and the foramen of Winslow—but this rarely—have been the seat of obstruction and strangulation of the bowel.

The causes of obstruction mentioned in these latter instances are attended by symptoms entirely similar, and only require to be separated as regards their pathological conditions, but in treatment may be considered under one head. However, those obstructions which are due to the products of inflammatory action may occur at any time of life, but most frequently in the young, are very uncommon in old age, and are often found in children; whereas strangulation by a mesenteric pouch is usually observed in advanced life.

Females are rather more liable to internal strangulation than males; for the appendages of the generative organs offer additional points for adhesive inflammation, and, consequently, entail so much more danger. In most, if not in all, of the conditions now under consideration, the small intestine is usually alone implicated.

The history and pathology of internal strangulation caused by false membranes and adhesions producing loop, &c., are best illustrated by the following cases:

A preparation in the Museum of St. George's Hospital shows the formation of a short band of lymph, adherent by one extremity to the free surface of a portion of small intestine; from this the band is seen to pass over another portion of small intestine, and then is immediately attached by the other extremity to the mesentery supporting the latter piece of bowel. As the effused band of lymph contracted, it so pressed on the portion of intestine which was crossed by the band, that entire stoppage of the bowels was produced.

A young lady, aged nineteen, died after a few days' symptoms of strangulation and vomiting. The omentum was firmly adherent to the anterior abdominal wall. This was the result of old adhesions. The small intestines were greatly distended. At the lower part of the abdomen, on the right side, and dipping into the pelvis, a large portion of sphacelated intestine was seen. This was about five inches in length, and consisted of the ileum, which was constricted and strangulated by a ring formed by lymph which had been effused in some former attack of inflammation. The ring was so firm that it was obliged to be cut through to liberate the intestine. It was formed by the band of lymph being attached by one extremity to the inner surface of the caput coli and stretched across to the ileum, to which it adhered by the other.

A child four years of age died after five days' constipation and symptoms of internal strangulation. The cavity of the abdomen contained some serum deeply tinged with blood. At the lower part of the belly several convolution of small intestine were highly congested and dark-coloured; this to the extent of a foot in length; and one portion of it was almost black in colour. This latter portion was found strangulated by a band of false membrane, which was attached by one extremity to the point of an appendix, by the other to the mesentery. The appendix was attached to the lower portion of the ileum, and was about an inch in length, and communicated with the bowel. The appendix and the band with its attachments, formed a complete ring about an inch in diameter.

A man, aged twenty, died after fourteen days' complete constipation. Near the termination of the ileum, a portion of it, nearly two feet long, much distended and much darker than the rest, was firmly constricted by a narrow band (not thicker than whipcord), which passed from the vermiform process to the ileum close to its mesenteric attachment.*

In a case in which a portion of small intestine was strangulated through a loop in the great omentum, perforation of the bowel had taken place, and had allowed the escape of fæces.†

A man, aged sixty-eight, was admitted into St. George's Hospital on March 7, 1861. He had been lifting some heavy iron about eight days previously, when he felt a sudden strain, and immediate severe pain in the loins and belly. He passed a restless night; the next morning there was slight action of the bowels. He complained of pain chiefly in the belly and dragging at the umbilicus; there was also constipation from the second day of pain. Four days after the attack he first vomited; but now everything taken was rejected. The skin was cold, and eye sunken; there was blueness of surface, and the pulse was small and weak; the tongue dry and brown; abdomen enormously distended and tympanitic. No stricture could be detected through the rectum. An enema-tube would not pass readily beyond a short distance. Mr. Johnson decided to open the descending colon, with a hope to relieve the distension; but the bowel, when cut down upon, was found collapsed. The question of making an exploratory opening in the abdomen from the front was considered, but decided against. The patient died on the eleventh day. The small intestine was very vascular. At the lower part of the ileum, close to the ileo-cæcal valve, a band crossed the small intestine, forming a ring around the gut and the commencement of its mesentery. The origin of the ring was observed to spring from the sigmoid flexure, which was drawn over to the right iliac region so as nearly to touch the cæcum. The tissue forming the ring was loaded with fat, closely resembling the structure of an epiploic appendix. The other appendices were very long and broad, and some were perforated at their base, and presented an incipient condition of such a ring as had embraced the intestine. There could be little doubt that this ring was either formed in an appendix, or was formed by the adhesion of two neighbouring appendices. The gut, where it was bound down, was deeply marked by the stricture. From the stomach to the situation of the obstruction the bowel was greatly distended, but more particularly at the lower part, where for about a foot in length it was stretched so tight that it burst under a stream of water thrown in to wash it out; and was nearly black from congestion. The constricting band was not adherent to the intestine, and after removal from the body the gut could be easily moved backwards and forwards in the ring. The position of the obstruction was immediately over the right common iliac artery. The cæcum and upper part of the large intestine were of the natural size, and contained fæces; the transverse and lower portion were empty and contracted.* The external wound was just below the left kidney.

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* *Path. Soc. Trans.* vol. ii. p. 62.

† Ibid. vol. i. p. 259.

Strangulation of bowel through the foramen of Winslow is most rare. We cannot point to any case within our own experience.

Obstruction caused by bowel becoming entangled or caught in a mesenteric or meso-colic pouch is not so unfrequent.

A specimen of meso-colic hernia, which had not been attended by strangulation of the bowel, was exhibited at the Pathological Society, by Dr. Peacock, in 1849; having been removed from the body of a man aged thirty. The left half of the transverse colon was deflected in a longitudinal direction, down the middle line, to the brim of the pelvis, and pushed forward by a large swelling, which projected on each side of the displaced colon. None of the small intestines were to be seen; but were found concealed in the swelling. This proved to be a large pouch formed by a fold of the meso-colon. It was opaque below, but the convolutions could be detected through it at the upper portion. The jejunum entered the pouch at the upper and posterior part; and the ileum passed out below and on the right side, about two inches above the termination of this portion of the intestine. There was no evidence of constriction of the bowel; nor did the displacement appear to have been productive of any inconvenience or disorder.

A second similar case was attended by strangulation of the intestine, and death. A man, aged twenty-seven, was seized with pain in the abdomen, and vomiting. He vomited everything taken, and the pain in the stomach was most severe. He died about forty-one hours after the commencement of the attack. The descending colon was found lying on the left side of the cæcum, and the small intestines were contained in a large pouch formed in the left meso-colon, and situated on the left side of the corresponding large gut. The ileum passed out of the pouch about two inches above the cæcum, and at that point the bowel was contracted, thickened, and gangrenous.†

6. Invagination, or intussusception of the bowel, is often the result of irritation caused by worms; of tumours attached to the mucous membrane; and of other accidental causes, not always to be detected or explained.

Invagination may frequently be observed in the post-mortem examinations of children. It also often takes place in grown-up persons of all ages and of both sexes, and may occur in almost every portion of the intestinal canal.

Invagination may occur in one or in several parts of the bowel at the same time in the same individual; but we take it to be almost certain, that when obstruction occurs, it is the result of one extensively invaginated portion of gut; and that when in post-mortem examinations several intussusceptions are met with, they are but slight, and have not been productive of urgent symptoms during life.

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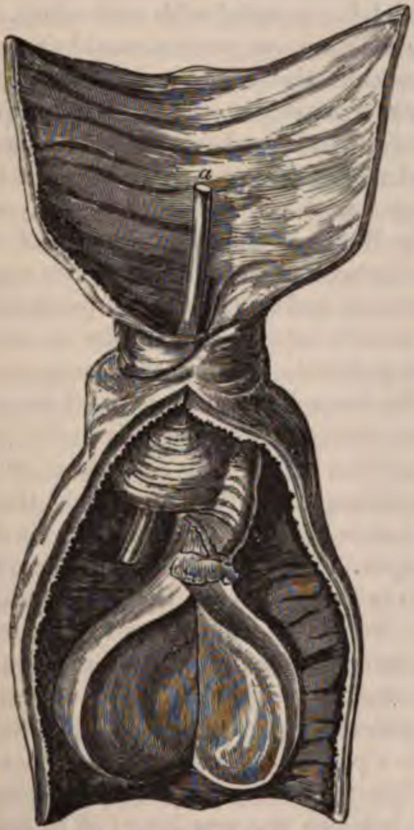
* *Path. Soc. Trans.* vol. xii. p. 111.

† Ibid. vol. ii. p. 60.

In the Museum of St. George's Hospital is a preparation, which shows an intussusception caused by the presence of a tumour growing from the wall of the bowel and projecting into its cavity. A process of sloughing has nearly detached the prolapsed portion from the rest of the intestine, and so almost set free the tumour. The patient died of peritonitis.

FIG. 263.



Intussusception, caused by the traction of a fibrous tumour of the intestine.

Another preparation in the same Museum displays a portion of small intestine invaginated, apparently from the irritation set up by an ascaris lumbricoides, which may be seen coiled round the prolapsed portion. But many other parts of the bowel were also invaginated; and when the patient died, the state of the bowel was not suspected.

The anatomy of intussusception is interesting; we must devote a few words to its conditions.

The usual form of intussusception met with is an inversion of a portion of intestine into the tube of the gut immediately below. But the relative conditions of the upper and lower portions of the bowel may be reversed; the intestine below may be projected into the intestine above, and this would still constitute an intussusception. This latter state must, however, be quite exceptional, even if it ever occur. The former is common and often fatal.

A perpendicular section through an invagination will display on each side, and lying parallel with each other, three layers of intestinal wall; a transverse section would show three rings of intestine, one within the other. In each section, whether perpendicular or transverse, the opposed surfaces of the intestine will correspond in character; peritonæum will touch peritonæum, and mucous membrane be in contact with a similar tissue. The outer surface of the external layer is of course peritonæum; the lining of the inner layer is of course mucous membrane; but between these there are two opposed surfaces of mucous membrane, and two likewise of peritonæum. Between the inner and middle layers, and in the space lined by peritonæum, will be a certain portion of mesentery or meso-colon dragged in by the inner layer of bowel as it becomes prolapsed. The limit of the invagination above is at the outer, or peritoneal surface of the bowel, and consists of an obtuse edge, formed by the folding in of the intestine at that point. The lower limit is inside the tube, and can only be observed when the gut is laid open. The portion of intestine which receives the invagination is a single layer; the invaginated portion, that which slips into the former, consists of two layers of bowel. A portion of mesentery will be found between these two layers, its size and shape varying with the length of the prolapsed intestine. The lowest extremity of this impacted mesentery is almost drawn to a point, and is near the extreme lower part of the prolapse. The mesentery is thicker and broader where it enters the fold between the two layers of intestine, so that it becomes somewhat triangular in shape as it lies between the two layers of intestine already alluded to. As the mesentery is attached to one margin of the bowel, the bowel in prolapsing is somewhat retarded by the mechanical action of the former; for the mesentery, being always in a state of tension, drags upon one side of the prolapsed bowel; it will therefore be found, especially in an extensive prolapse, that the prolapsed end of the gut, its inner extremity, is turned in the direction of the attached mesentery; from which circumstance the piece of bowel presenting the prolapse will be found slightly curved to one side, and thus the whole mass assumes a crescentic figure.

Rokitansky, in referring to this condition, makes the following important remarks. 'Firstly, that the invaginated portion does not lie parallel with its sheath, but always offers a greater curvature than the latter, the inverted tube being compressed on its concavity into tense transverse folds. Secondly, that the orifice of the invaginated portion of bowel does not lie in the axis, or in the centre of the sheath, but towards the side; and that, following the traction exerted upon it by the mesenteric fold that belongs to the inverted intestine, it is directed towards the mesenteric wall of the sheath; that the opening is not circular, but represents a fissure. This affords a diagnostic sign for the examination of intussusceptions of the rectum, which are within the reach of manual exploration.'*

Invagination may go on to involve a large portion of the small, and the greater portion of the large intestine. When an intussusception increases in size, the *involution* is that of the bowel below the commencement of invagination; if this commences at the lower part of the ileum, more of the upper ileum does not disappear, but the prolapse grows in length at the expense of the inferior portion of the intestine, cæcum, ascending colon, &c.; each of which in turn would become folded in, as the prolapse increased.

We do not attempt to explain the causes of intussusception. In all probability, an empty state of intestine, and some irritating cause under such conditions, are essential to its production.

If invagination increases beyond a slight extent, a change will soon occur in the condition of the implicated piece of bowel; which, we may predict, places it beyond hope of reduction, accidental or applied. From the pressure exerted on it and its mesentery, congestion, followed by inflammation, soon commences. The result of this condition is a more than natural secretion from the mucous surface, and often a bloody discharge mixed with mucus. This is a symptom of some importance in the diagnosis of intussusception. The whole mass then becomes thickened, and peritonitis usually commences about the upper part of the invagination, and extends more or less over the general surface. This onset of peritonitis is usually sufficient to insure adhesion of the opposed surfaces of the peritonæum, at the entrance or upper ring of the sheath. At this line there will also be a certain amount of strangulation exerted upon the portion within the ring. This is the first step in the effort made by nature to remedy the evil, now rendered irreducible, in order that presently the prolapsed portion may be cast off by sloughing; and that the escape of the contents of the bowel may be provided against, by the union of the upper and lower portions of the otherwise severed intestine.

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* *Path. Anat.* vol. ii. p. 55.

Peritonitis of a severe character usually occurs when a large portion of intestine is involved, and soon carries off the patient; but should he survive this attack, he may yet recover. The involved portion may slough, and be passed by stool, and the patient rise from his bed convalescent in a few weeks.

The further history and treatment of intussusception is best illustrated by the following cases.

A boy, nearly five years of age, complained of soreness about the anus, the result of ascarides. The next day he was seized with sudden pain in the lower part of the abdomen, and strained several times at stool, but passed nothing. He soon afterwards vomited. He continued to go to stool every half-hour. In the afternoon he experienced constant desire to go to stool, and passed a clot of blood. On some of these occasions he passed dark-coloured blood and slimy matter. There was great restlessness, and thirst. The abdomen was more swollen above than below the umbilicus. There was much tenderness over it on pressure. The symptoms continued unrelieved, and death took place on the fifth day. A considerable intussusception had occurred of the ileum through the ileo-cæcal valve; the appendix was also carried in. About 3½ inches of bowel protruded into the cæcum. The involved part was of a deep red colour. It was so firmly grasped by the ileo-cæcal valve, that the effort to reduce it appeared likely to tear the bowel.*

A child, six months old, died after sixty hours of suffering from vomiting and discharge of bloody mucus from the rectum. The whole of the colon, ascending transverse and descending, had passed into the sigmoid flexure. The mucous membrane of the prolapse was purple from strangulation.†

The two foregoing cases mark the prominent symptoms of acute invagination of intestine; sudden pain; constant and urgent desire to stool, with little fæcal matter passed, but blood in clots or bloody mucus escaping in small quantities; more or less vomiting; great distress, both general and local; and death following in a few days. But death may be somewhat sudden.

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* *Path. Trans.* vol. ii. p. 55.

† Ibid. vol. ii. p. 56.

A sailor, during a railway journey, was observed to place himself on the floor of the carriage, but had no attention paid him by his fellow-passengers. At the journey's end he was found dead. The abdomen presented marks of severe peritonitis. A fold of intestine near the termination of the ileum, six inches in length, was intussuscepted and gangrenous. Probably in this instance the mischief was of some few days' duration.*

In other instances the symptoms appear to extend over a much longer period, and ultimately prove fatal; or if the strangulated bowel slough off, may terminate favourably.

A man, aged twenty-five, suffered from attacks of colicky pain in the abdomen, and gradually lost flesh. One day he became suddenly worse, and on the following day died; nearly four months from the supposed date of the commencement of his attack. About six inches of ileum, cæcum, and the first part of the ascending colon, had passed into the large bowel beyond. There was no appearance of gangrene in any part. The colon contained much mucus and coagulated blood. The mucous membrane was turgid and purple. The involved layers of the intestine were firmly adherent to each other by dense bands of false membrane.†

Recovery after the passage of the strangulated portion of the bowel through the rectum is the only fortunate result that we can anticipate in a case of chronic intussusception, and fortunately is a result which occasionally takes place; nor does the loss of the bowel appear to be attended by any subsequent evil consequences, *i.e.* contraction or stricture of the gut, so far as we have been able to investigate the subject.

A boy, aged five, was taken ill four months previously to the time at which a mass of bowel was passed. At first he suffered from simple fever, but afterwards experienced much distress. He complained chiefly of pain in the region of the bladder; but there was no tenderness. The urine was sometimes retained for a long time. The bowels were very much confined, sometimes for fifty hours. There was occasional vomiting. He was never known to pass blood. *Eight inches of the ileum, the cæcum with its appendix*, and about four inches of the colon, were passed by stool. The tissues were almost black, and offensive. Diarrhœa preceded the discharge of the separated bowel. At the end of six weeks from this event the little patient seemed quite well, and the bowels acted regularly.

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* *Path. Trans.* vol. i. p. 77.

† Ibid. vol. vii. p. 193.

This case occurred in 1847, under the care of Mr. Hesilridge Buckby, of Sutton-on-Trent. In September 1863, he kindly wrote to the author to the following effect: 'I have much pleasure in informing you my little patient has continued *in perfect health* ever since his restoration. I saw him the other day.'

V. T., aged eighteen, was seized with severe paroxysmal pain in the abdomen. This continued and increased without relief; and was followed by stercoraceous vomiting. Symptoms of general peritonitis came on, without any relief from the bowels. The more urgent symptoms were relieved under the use of calomel and opium; but no evacuation was obtained. On the tenth and following day enemata were returned without any fæcal tinge. On the twelfth day some fæculent matter was brought away: and more fæces passed after a dose of castor-oil. On the nineteenth day he had three motions. The last consisted of bright florid blood, mingled with many portions of the small intestine. The two previous motions were said to have been of precisely the same character, and to have contained many 'skins.' At the expiration of six weeks the patient returned to his usual occupation.*

Peritonitis may be the result of perforation of the bowel during the separation of the sloughing prolapse; in which case death is generally rapid, and attended by acute pain and much suffering.

The average number of deaths from intussusception, taking all ages, must be very small. In five years there were admitted into the Hospital for Sick Children, in-patients 1,920, out-patients 46,298—total 48,218. Only one death from invagination of the intestine occurred among this number of patients.

It will appear that, although invagination has been classed with the causes of acute strangulation, many cases occur in which these symptoms are not very acute, and last some time, or even terminate in recovery, though at a sacrifice of a portion of the bowel.

Invagination may be suspected when there are present acute pain, sudden in its attack, and confined in extent; constant and urgent desire to stool, without any relief, with the passage of blood and mucus; and sometimes a swelling, sausage-like in shape, may be felt in the ileo-cæcal region; with constipation and vomiting; but all evidence of swelling is frequently wanting. No age is exempt from invagination; but children are most liable to its occurrence. The pain in such instances is often intermittent: when present, the child doubles itself forwards, and often rests its head on the bed, kneeling.

The treatment should chiefly consist of opiates; with the addition of calomel when peritonitis sets in, and leeches to the part in pain. The proposal to open the abdomen should not be entertained. The cases recorded will justify this opinion. And if general measures give no relief, we have only the one hope left, that the involuted portion may be thrown off by slough, and thus the obstruction be removed.

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* *Path. Trans.* vol. vii. p. 199.

Distension of the lower bowel with fluid or air has been recommended, and even stated to have been successfully applied in cases of urgency; but however promising this kind of treatment may appear, it must be recollected that, even when the abdomen has been opened, it has been difficult, and in some cases impossible, to reduce the involution without tearing the bowel. A case is, however, recorded by Dr. Baldwin of Jacksonville, Florida, of recovery in supposed invagination, treated by injecting a very large quantity of fluid into the rectum.*

We have now to consider the more chronic conditions productive of obstruction.

1. Habitual constipation may become accidentally prolonged to such an extent as to cause anxiety; or the accumulation of fæcal matter may be mistaken for a tumour, so circumscribed occasionally is the collection in the large intestine. The time which may elapse while the bowels are entirely closed, and the amount of fæces which may be collected therein, would surpass belief, were it not that the experience of those now living can confirm the statements made by writers on this subject.

A lad, aged seven, on recovering from an attack of fever, was affected with great torpor of the bowels. This gradually increased to such an extent, that in two years treatment failed to have any effect. When admitted into the Free Hospital, under the care of Mr. Gay, *nothing whatever had passed from the bowels for three months.* The health had not suffered; the appetite was good. The body was greatly enlarged, and was forty-nine inches in girth; and there was inconvenience to respiration. There was considerable prominence on the left side, as if the colon and sigmoid flexure were chiefly loaded.

A speculum was passed into the rectum, and after dilating it, an enema tube was passed high up. The contents of the bowel were washed out by a stream of warm water kept constantly playing upon them, for half an hour at a time. A large quantity of hard black fæces, like cinders, was brought away. These measures repeated several times reduced the girth of the abdomen to twenty-six inches.†

The surgeon is usually consulted at the latter period of obstinate constipation, which has at last arrived at complete obstruction of the intestine; and as all power of propulsion is then lost, the contents have to be removed mechanically. This can only be done by the aid of repeated warm-water enemata; or by means of some kind of scoop or short lever, with which the lowest masses of hardened fæces should be carefully dislodged.

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* *American Journal of Medical Sciences,* Oct. 1852, p. 568.

† *Path. Trans.* vol. v. p. 174.

Purgatives in such cases are not of much use, until the load is somewhat reduced in the lower bowel.

The following very instructive case is mentioned, in a letter to Dr. Burne, by the late Dr. R. Williams, Physician to St. Thomas's Hospital. A lady, aged thirty-five, was attacked with severe gastrodynia, and most obstinate constipation. Paroxysms of the pain recurred at short intervals, gradually became more frequent, and at length quotidian. Each meal was followed by pain so severe and continued, that she limited herself to dry biscuit and brandy-and-water; and this was commonly rejected. Nothing gave relief but opium, of which, for months, she took not less than sixty grains daily. Her bowels, independent of the astringent effects of opium, were always greatly constipated; and no quantity of salts, oil, or senna in the least moved them; elaterium, croton-oil, or other powerful purgatives, immediately inverted the action of the stomach, and were rejected. Calomel was the only medicine which would act upon the bowels, and this not until her mouth was affected.

From this cause she frequently had no evacuation for *six weeks* together: and in one year, when much weakened by repeated salivation, so that it was necessary to defer the administration of the calomel as long as possible, she had only one evacuation every *three months*, or *four in the year*.

At the times her bowels acted she suffered immensely, her pains being more severe, if possible, than those of labour. The fæcal matter when passed was enormous in quantity, healthy in colour, and was formed into large round lumps or scybala, each certainly not less than a large fœtal head, and so numerous as often to fill a common-sized pail.*

We may, perhaps, have travelled somewhat from the path of our especial calling, in introducing the latter cases, illustrative of chronic obstruction of the intestine. But the accumulation of large quantities of fæces is often productive of a strange and anomalous train of symptoms; often such as indicate structural obstructions; or simulate morbid growths in the abdominal cavity. Experience, discrimination, and careful examination are often requisite to insure a corect diagnosis as to the true nature of these collections: and without extreme caution, the surgeon may be baffled in his attempts to unravel the conditions attendant on a loaded intestine, accompanied by obstinate constipation. With a gut greatly distended by fæcal matter, and with the symptoms of organic obstruction, it will frequently happen that the bowels act freely, and yet without relief, or any reduction of the size of the abdomen. It is but the overshot of the sluice; the head-stream is dammed up; the canal is loaded to overflowing.

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* Burne, *On Habitual Constipation*, p. 28.

2. Obstruction, the result of injury, we need but allude to here. The conditions and treatment have been already described; see Vol. II. p. 626.

3. Constipation, occasionally amounting to obstruction of many days' standing, or even of a fatal character, is apt to occur in cases of peritonitis, attendant on tubercular deposit in the subserous cellular tissue, or the result of other causes; a condition often accompanied by ulceration of adjacent and adherent surfaces of the intestine.* A direct communication thus takes place between two or more opposed surfaces of bowel: often an abscess is found within the abdomen, communicating through ulcerated openings with several portions of the intestinal canal; there is great irritability of the stomach, and often rejection of all food; an unyielding abdominal wall, and an irregularity of its surface; general but not exquisite tenderness; and constipation of, perhaps, some days' standing. Such symptoms might, at first sight, convey the idea that obstruction was due to some of the causes previously enumerated. But in such cases as we have now under consideration, there are usually general indications of tuberculous cachexia long before symptoms of obstruction set in. The condition of the bowels is, however, as a rule, extremely uncertain in these cases: occasionally confined, but more frequently purged. With adhesion of peritoneal surfaces, and ulceration through the coats of the intestines, obstruction is rare; and is rather the exception, unless the calibre of the bowel is contracted by the pressure of abscess, or diminished by false membrane, or other media, stretched across the tube. Looseness of bowels is the usual condition in the cases just considered.

4. Stricture of the intestine is the most common cause of obstruction.

Strictures of the intestine occur under various conditions, independent of cancerous deposit in the walls of the gut. The chief causes of simple stricture are due to the action of caustic substances; to the presence of foreign bodies, causing ulceration and contraction; to tuberculous ulceration; to ulceration of the mucous membrane without any known cause; to the thickening attendant on old reducible hernia; and to an inflammatory action taking place in the walls of a portion of the intestine, terminating in the effusion of fibrine, and subsequent contraction of the canal.

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* An interesting case is recorded by Dr. Bristowe, *Path. Trans.* vol. viii. p. 200.

Stricture, the result of disease of the upper portion of the small intestine, is rare. We believe, when met with, it usually follows cicatrisation and contraction after ulcer, the direct effect of some escharotic accidentally or intentionally swallowed; or of some other form of ulcer which, in healing, has contracted the diameter of the gut.

Stricture of the duodenum is uncommon. We have met with a few instances of it. In the Museum of the College of Surgeons is a specimen of a stricture of the duodenum; the stricture is half an inch in length. It appears simple in its character, but has no history attached to it.[*]

The following case well illustrates the effects of an escharotic substance introduced into the stomach. A woman, aged forty, accidentally swallowed about half a wine-glassful of 'Burnett's solution' (chloride of zinc), and was immediately seized with violent pain and vomiting; but under treatment recovered from the immediate effects of the poison. A month afterwards, pain and vomiting returned: and in about two months after she was admitted into St. Mary's Hospital, under the care of Dr. Markham. All food taken was rejected; and she died about four weeks after her admission, and some three months after taking the fluid. In the pyloric portion of the stomach, about an inch and a half above the valve, the stomach was so contracted as only to permit the passage of a small bougie. The constriction was clearly the result of a cicatrix.[†]

A young lady had accidentally some 'Burnett's fluid' given her instead of a dose of medicine. Acute pain and vomiting were the immediate result, and for many months life was despaired of; by degrees the stomach became more tolerant of food, and was able to retain small quantities of fluid nourishment, taken at frequent intervals. It is now some five years since the accident; but still the greatest care is requisite on the part of the patient as regards her diet. It can only be taken in a fluid form, in small quantities: and is generally required at intervals of four hours. Solid meat, or indiscretion in quantity of food, at once produces vomiting, and the contents are rejected. The health is in every other respect good. No doubt some contraction has taken place from ulceration, caused by the caustic applied to the pyloric extremity of the stomach or to the duodenum.

Stricture following other forms of ulceration is occasionally met with. A specimen of stricture of the ileum after ulceration is recorded by Dr. Bristowe. The ileum and lower part of the jejunum presented numerous ulcers, mostly cicatrising. At the commencement of the ileum a cicatrix had formed, and reduced the calibre of the intestine to such a degree that the point of the little finger could barely be inserted. Below, the bowel was contracted; above, it was considerably dilated. One slough, opening through the intestine, allowed the escape of fæculent matter into the peritoneal cavity. The intestinal wall at the strictured part was an inch thick. Throughout the large intestine were numerous cicatrising ulcers. The history of the patient did not throw any light on the case. For some years she had been liable to sudden attacks of pain and constipation.*

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[*] Series xxiii. No. 1176.

[†] *Path. Trans.* vol. x. p. 164.

A man, aged fifty-four, had been poorly for twelve months. At the commencement of that period he had suffered from an attack of fever, since which he complained of pinching pain in the bowels; the abdomen became swollen; and he lost flesh. He could take very little food; was constantly sick, but the bowels acted once or twice daily. A constriction of the ileum was found at the junction of the upper with the middle third, dependent on great thickening of the walls of the bowel. The stricture was an inch long, and barely admitted the tip of the finger. Immediately above this, the bowel formed a pouch, the parietes of which were thinned almost to perforation. In this pouch were found thirty-three plum-stones, and sixteen cherry-stones, all perfectly black; and half a dozen recently-swallowed orange-pips. There was an oblique inguinal hernial sac, into which it was evident, from the position of the parts, that the strictured portion of the intestine had been in the habit of passing.†

These two cases are interesting when we consider the causes of the strictures described. In the former, though there was extensive ulceration of the bowel above and below the stricture, the symptoms, and the nature of the latter, incline us to believe that contraction of the bowel from cicatrix was the primary disease. In the latter case it is most probable that inflammation, produced by the bowel frequently slipping into the old hernial sac, was the original cause of the stricture, quite independent of the attack of fever, or any ulceration of bowel following that attack.

In allusion to this consideration, viz. whether the ulcerations of intestine in fever are subject to contraction, and are thus productive of stricture, Rokitansky observes that the cicatrices 'have occasionally been observed thirty years after the fever had occurred;' and he adds, 'it is singular and characteristic of this ulcer and its cicatrix, that they never in any way give rise to a diminution of the calibre of the intestine.'‡

Of the healing of ulceration, the result of tubercular infiltration, he further observes: 'In consequence of the contraction of the ulcer, a cicatrix forms on the surface of the intestine, which presents a more or less elevated ridge on the internal surface of the intestine. If the ulcer was of considerable size, or if it encircled the entire intestine, a callous annular ridge remains, which diminishes the calibre of the intestine, and when viewed from without occasionally gives rise to an appearance of invagination. Thus the healing of a tubercular intestinal ulcer is always accompanied by a diminution of the intestinal calibre.'*

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* *Path. Trans.* vol. iv. p. 153.

† Ibid. vol. x. p. 154.

‡ *Path. Anat.* vol. ii. p. 73.

So, also, in the ulceration of the bowel under attacks of dysentery, he observes: 'In cases of extensive destruction of substance, the approach of the edges is rendered impossible; the deeper layers of the tissue, which takes the place of the mucous membrane, is frequently condensed into fibrous bands, which form corded projections into the intestinal cavity, interlace with one another, and not unfrequently encroach upon the calibre of the intestine, in the shape of valvular or annular folds, thus giving rise to a stricture in the colon of a very peculiar form. This mode of regeneration is more remarkable, as it closely resembles that following the destruction of the œsophageal mucous membrane by mineral acids.' †

A case of stricture of the sigmoid flexure, near its junction with the rectum, is reported by Dr. Peacock.‡ The contraction was apparently due to the cicatrix of an old ulcer. There was much thickening, puckering, and induration of the internal tunics. There was no appearance of any cancerous deposit. Immediately above the stricture the cavity of the intestine was very large, and an ulcerated aperture of sufficient size to admit the passage of the thumb, existed on the anterior and inner side; a portion of fæcal matter had escaped into the cavity of the pelvis.

5. Obstruction may also be the result of stricture, dependent on cancerous deposit in or about the walls of the intestine. Less frequently, it is occasioned by tumours or cysts pressing on the bowel: such as fibrous tumours of the uterus; ovarian cysts; hydatid growths, or other masses, which originate in, and encroach upon, the abdominal cavity. The ultimate effects of most of these causes of obstruction are equally fatal. Their treatment must of course vary according to their conditions; but life may be prolonged many months under proper care and judicious management. Cancerous affections of the intestine usually run the most rapid course; but even in these cases life is occasionally prolonged much beyond the period which may at first be anticipated.

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* *Path. Anat.* vol. ii. p. 96.

† *Path. Anat.* vol. ii. p. 87.

‡ *Path. Trans.* vol. xiii. p. 97.

Cancer of the intestine occurs most frequently in the large bowel. When the small intestine is affected, usually the disease has attacked it secondarily, having originated in some contiguous viscus. The nature of the deposit varies much in different cases: true scirrhus, medullary deposit, or villous growth, will each be met with; but the latter less frequently than the former, and true scirrhus less often than the medullary form of cancer; but, as Rokitansky justly observes, they 'may be combined with one another, from their first origin, or consecutively.'

'The colon,' he continues, 'is almost exclusively the seat of cancerous degeneration; but there is a gradation in the proclivity of its different sections to the affection. The rectum is most frequently attacked; in second order, the sigmoid flexure; and the remaining portion of the colon but rarely. . . . Carcinoma occurs as a primary affection of the intestine in three forms. Firstly, in the mucous membrane, as carcinomatous infiltration of the erectile tissue, into which the former has been previously converted—fungus; secondly, more frequently in the submucous cellular tissue, as round nodulated accumulations; thirdly, most commonly as an annular deposit of the cancerous tissue in the submucous cellular layer.'* And he adds, that 'cancerous stricture of the intestine is the most common variety of stricture that results from alterations in the intestinal coats, and at the same time the one that advances to the highest degree.'

The following case illustrates the history of such a stricture:

A man, aged fifty-eight, was admitted, under the care of Mr. Birkett, into Guy's Hospital, with constipation, which had existed for a week. Twelve months previously the patient had been attacked with diarrhœa, sickness, and great pain over the whole of the abdomen. The diarrhœa ceased, but the attacks of sickness and pain recurred at intervals. He lost flesh. The bowels were sometimes costive, at others relaxed. He became gradually worse in every respect, and then sought admission into the hospital. At this time he had constant nausea; frequent vomiting every two or three hours, and always after taking food. The abdomen was tense, but not tympanitic. There was a swelling in the right inguinal canal, but no hernia could be detected. Two days after his admission, as the symptoms were not relieved, Mr. Birkett cut down upon the old hernial sac; but no intestine was found in it. The symptoms became gradually more distressing, and the patient died about four days after admission. The right flexure of the colon was constricted, as if a string had been tied round it. 'Within this constricted part, a growth was seen attached to the anterior wall of the bowel; and was of the nature described by Rokitansky as "villous cancer."'[*]

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* *Path. Anat.* vol. ii. p. 97.

Malignant, or cancerous deposit, productive of stricture of the intestine, though usually found to affect persons past the meridian of life, may occasionally be met with in youth.

A boy, aged fifteen, was the subject of a stricture of the rectum from three to four inches from the orifice of the bowel. The stricture was very tight, and accompanied by ulceration of the mucous membrane. The stricture was caused by the deposit of medullary cancer external to the muscular fibres of the gut. The patient died of acute peritonitis.[†]

Advanced age generally appropriates to itself those forms of intestinal obstructions which take their origin in cancerous deposits. From the pylorus to the ileo-cæcal valve, from the cæcum to the rectum, there is no portion invulnerable to their attacks. Occasionally they are found to affect the duodenum; somewhat oftener the jejunum and ileum; most commonly the lower portions of the large intestine. If medullary stricture be found in youth, the rectum is almost invariably the seat of the mischief.

The pressure of a fibrous tumour has been known to produce obstruction. An ovarian cyst may occasion stoppage of the bowels.

A woman was admitted into the Middlesex Hospital, under the care of Mr. Moore, suffering from constipation, and at the same time was the subject of a large ovarian cyst. The constipation did not yield to treatment until the fluid of the cyst was withdrawn, when entire relief was afforded to the symptoms of obstruction.

Spasmodic strictures, as they are termed, appear to depend on disordered or costive bowels; and need no comment from us.

Before entering upon the consideration of the treatment of obstructions of the intestines, it appears desirable, 1st, to attempt some kind of estimate of the periods of life at which different kinds of obstruction may occur; 2nd, to review generally the respective symptoms dependent on those various organic or accidental conditions; and 3rdly, to determine under what circumstances, and with what hopes, operative interference may be adopted.

As regards our first proposition, we have arrived at the following, rather general, conclusions: that obstructions occur in the following order of frequency, from the various causes mentioned, in youth, middle age, and old age: viz. in youth, from internal strangulation by bands of lymph, omentum, or adherent diverticula; from adhesions of various coils of bowel to each other; from intussusception; from foreign bodies taken by the mouth; from cancer, rarely, and hitherto found in the rectum only:—in middle life, from twists of large or small intestine; from gall-stones, intestinal concretions, and foreign bodies; from intussusception; from simple stricture; from mesenteric hernia; from internal strangulation by bands, &c.; from peritonitis, often resulting in abscess; from simple constipation; from cancer:—in advanced life, from cancer; from thickened intestine, the result of old reducible hernia; from intussusception; from simple stricture; and lastly, from internal strangulation.

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[*] *Path. Trans.* vol. iv. p. 154. The preparation is illustrated by an excellent engraving in the *Transactions.*

[†] Ibid. vol. i. p. 67.

The following table indicates the relative frequency of different causes of obstruction irrespective of age. The results are taken from Mr. Hinton's valuable communication on intestinal obstructions.*

In 135 cases, the following were the causes of obstruction, in the order of their frequency:

Diseased uterus		1
Stricture of ileum		1
Cancer of small intestine		2
Internal hernia:		
Inguinal, high up	1	8
Diaphragmatic	2	
Meso-colic	2	
Obturator	3	
Fæcal accumulations		3
Twist of sigmoid flexure		4
Concretions, calculi, foreign bodies		7
		26
In first col.		26
Doubtful		8
Peritoneal adhesions, tubercles, &c.		9
Stricture of sigmoid flexure		10
Ditto colon		11
Ditto rectum		11
Intussusception		24
By bands, adherent diverticula, uterine appendages, &c.		36
Total		135

From whatever cause obstruction has its origin, the symptoms are commonly so similar, that a correct diagnosis as to the exact seat of the block is not to be expected. We may, however, by careful inquiry and examination, approach near it. But whether occasioned by intestine entangled in a loop, or fissured omentum; by a cicatrix, or simple stricture; by a foreign body; or by a twist contracting the gut—the symptoms do not vary much in character, though they will in degree and in the period of their commencement and sequence. Constipation and pain, vomiting, and tension of the abdomen, each and all may be present; and should be present, to constitute the conditions of absolute obstruction.

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* *Association Medical Journal*, 1853, p. 431.

But we are of opinion that intussusception should be excluded entirely from the above general observations. The usually early and marked symptoms of invagination are sudden, often acute pain, as severe as it is sudden; constant desire to pass motions, and perpetual attempts made to this purpose without any relief. Most commonly there is discharge of blood mixed with mucus, or pure blood in a fluid or clotted form. From no other cause of obstruction have we seen such perpetual desire to stool in the early part of the attack; nor, with such attempts, the passage of blood and mucus. Sometimes a small quantity of fæculent matter is mixed with the mucus, but often only enough to colour the discharge. Intussusception, again, is the form of obstruction which occurs earliest in life. We have known it occur in an infant at the breast between five and six months. Mr. Hinton mentions a fatal case at the age of two and a half months. In men affected with intussusception, similar symptoms are observed. The disease is more rare in old age; the oldest of which we have a record was in the fifty-sixth year.

The symptoms attendant on obstruction from other causes will vary according to the completeness of the strangulation, or block. In all internal strangulations, by bands, &c., the symptoms are usually very acute; the pain is sudden, sharp, even agonising occasionally; vomiting sets in early, and is usually incessant; the distension may not be as great as in the more slowly-operating causes of obstruction, since little food can be taken, but still the small intestine becomes much loaded; there is generally great tenderness on pressure, for usually peritonitis is not long absent; there is early evidence of grave constitutional damage, for the portion of intestine, tightly bound down or encircled at the strictured part, soon thickens and inflames, or may blacken and mortify.

In twists of the large bowel; simple stricture, or cancerous contractions; foreign bodies; loaded intestine; abscess of abdomen; and other chronic causes of impediment, the symptoms may vary to some extent, and in most of these instances may present themselves gradually.

Constipation, more or less difficulty in defæcation, small long thin or flattened motions, constitute the primary and alarming symptoms of commencing stricture. The belly becomes distended by degrees, as the obstruction increases; pain follows upon the increase of contents; often transient periods of diarrhœa occur. Vomiting is frequently absent till quite a late stage. Of course something depends on the position of the obstruction. If it occurs in the upper portion of the intestinal canal, vomiting occurs early in the case, and distension of the abdomen is less marked. If in the lower bowel, sickness sets in late, but great accumulation may occur in the large gut, and the peritoneal coat be in consequence ruptured before death, unless timely relief be afforded.

The examination of the general surface of the abdomen does not often convey much, if any, idea of the exact seat of the obstruction, unless it be caused by a tumour in that cavity. Occasionally, with a twist of the sigmoid flexure, the chief swelling has been observed on the left of the umbilicus; but very little dependence can be placed on such evidence for a satisfactory solution of the exact cause or seat of the obstruction. The examination of the rectum often conveys more satisfactory information. The obstruction may be often here detected by the finger, or bougie; water thrown up may be immediately returned, or a small quantity may be retained, sufficient to indicate that a stricture, not to be detected by the finger, exists higher up.

A long tube passed up the rectum may frequently detect the actual obstruction; but it is often apt to deceive us as to the seat of the stricture. It is, however, always desirable, in all cases of obstruction, to attempt its introduction as far as possible without any force, and to inject warm water frequently and plentifully, if any fæcal discharge accompanies the return of the injected fluid.

The emaciation which usually accompanies cancerous deposits in other parts, the existence of fæcal fistulæ in the abdominal wall, the bladder, or the vagina, are symptoms of frequent occurrence in cancerous stricture. Hepatic pains of previous years, or months, the symptoms of former mischief about the gall-bladder, point towards the supposition that a biliary calculus may have ulcerated into the duodenum, and produced the obstruction by blocking up the canal. Concretions, the offspring of particular kinds of food, the stones of fruit, or substances swallowed under peculiar conditions of hysteria or mania, produce similar symptoms of obstruction.

The treatment of obstruction of the bowels is a question of the deepest interest. Notwithstanding the experience of recent years, it must ever be regarded with anxiety, as it will always be subject to much discussion. There is too frequently a hopeless condition when the surgeon is called in. Death occurs often so early in the scene, even in a constitution otherwise healthy, that the medical attendant has little time to propose, or the patient to acquiesce in, measures which involve life; it becomes, therefore, a matter of grave importance to decide upon rules for our guidance under such perplexing circumstances.

The subject is not a new one, and yet little notice has been taken of it in systematic works on Surgery. The detached writings of Callisen, Littre, Amussat, Phillips, Heven, Cæsar Hawkins, Curling, and others, have of late years drawn more attention to its consideration; whilst the experience derived from our hospitals, and the results of more recent operations, have to a great extent sanctioned surgical interference for the formation of artificial anus, when other medical treatment has failed.

In the management of this class of cases, purgatives should be scrupulously avoided. This is a precaution to be adhered to most rigidly at the commencement of the symptoms. But if there be one golden rule to guide us in the treatment of cases of obstruction, it is this: that opium be administered by the mouth, and aperients only by the rectum. Every rule may have an exception; but experience has taught us, that whenever this rule has been departed from, subsequent occasion for regret has arisen. In the early and more acute symptoms, small and repeated doses of calomel may be combined with opium if peritonitis be suspected, or is already well marked. Leeches and hot fomentations may be applied to the abdomen, especially if great pain and acute tenderness exist. Enemata should be used frequently and in large quantities, especially if it be suspected that the obstruction is the result of impacted fæces.

The introduction of the long tube may be attended by some difficulty, but if successful, secures a most efficient administration of enemata. The use of enemata may occasionally prove injurious. In a case of twist of the sigmoid flexure, the enemata injected in the usual manner were retained, and never returned. Subsequent to death, it was found that a long tube could be inserted beyond the twist into the dilated bowel; but in consequence of a flap-like entrance at the commencement of the latter, the fluid injected into it could not be returned. The enemata used in such cases should be warm water, their mechanical action being of far greater importance than their specific properties.

In the management of every case of supposed intestinal obstruction, every variety of solid food should be rigidly prohibited. Life should be entirely sustained by fluid nourishment.

When situated low down in the sigmoid flexure, or upper portion of the rectum, the obstruction will be more readily detected, as the accumulation in the larger bowel increases. In such conditions it is prudent, if practicable, to overcome the immediate effects of obstruction, by passing a small gum catheter through the stricture, and injecting warm water into the bowel; or by introducing the finger gently and slowly into the gut above, to dilate slightly the contracted part. In the latter attempt much care is necessary. The passage of the finger should not be hurriedly or hastily effected. The stricture in these parts is commonly the result of cancer; the parts are consequently thickened, often ulcerated, and brittle under manipulation. The duration of the disease has allowed it, probably, to implicate the whole structure of the surrounding gut, and has often involved the peritonæum in the diseased mass. As the bowel, from the load above, is pressed down far lower than its natural relations, the peritoneal reflexion in consequence comes much nearer the external aperture; a sudden dilatation of the diseased bowel, a rapid thrust of the finger through the obstruction, can only be effected at the expense of some laceration of the diseased tissues.

A man was admitted into St. George's Hospital, under the care of Dr. Nairne, with constipation of some days' standing. Treatment having failed to procure any action of the bowels, the author was requested to make an examination of the state of the rectum. This was found pushed down so that the orifice was on a level with the lower edge of the nates. A stricture was readily felt, within a short distance of the anus, pressed down, however, by an immense collection of fæcal matter. A small gum catheter was introduced without difficulty, and allowed the passage of some fluid fæces and flatus, with great velocity. The forefinger was subsequently passed very slowly through a rather resistant contraction of the bowel, the result of large deposit around it. The man shortly had great desire to pass a motion, and a copious evacuation of fluid fæces took place; but while on the close-stool, he was seized with excruciating pain, which continued for some time. He died the following morning. The intestines were greatly loaded, especially the lower bowel. In the pelvis, recent effusion of lymph and fæculent extravasation were observed. A small rent in the peritonæum on the anterior face of the rectum, just above the recto-vesical fold, ran through the diseased (cancerous) mass into the cavity of the gut; a rent no doubt made in the wall of the bowel during the dilatation of the stricture by the finger. Through this rent the fæces had passed into the cavity of the peritonæum.

We have now to discuss the conditions under which it is justifiable to operate in obstruction of the intestines, when all other efforts have failed to procure relief.

The operations for the relief of obstruction are of two kinds. In one (Littre's), the abdomen is opened by cutting through the peritonæum. In the other (Amussat's), the intestine is opened in the loin, external to the peritonæum.

The duration of constipation is not *the positive* indication for such interference. Death takes place in three or four days, if perfect strangulation of the bowel has occurred from the pressure of a band of false membrane, or from intestine having slipped through some contracted aperture in the omentum or mesentery. In such a case, constipation is not the most important symptom. It is not *the* symptom, which of itself indicates the absolute necessity of active interference, or the hazard of delay. In common or cancerous stricture of the rectum, constipation is not often complete or continuous, although the accumulation of fæces may be great. Six weeks or two months may elapse without a motion, and without fatal results from such an occurrence. Constipation here again is not alone *the* symptom which warns the surgeon to act with his knife. In constipation following peritonitis the result of injury, in habitual or other accidental constipation, the bowels may remain locked up for a month, or even two, and yet ultimately yield to treatment or time, and recovery take place. Constipation in the latter instances cannot, therefore, be taken as *the* signal for the establishment of an extraneous outlet to the contents of the bowel.

But in the more acute instances of strangulation, with vomiting, pain, and distension, complete constipation must be present to justify operative interference. In the more chronic instances of obstruction, no matter how great the distension of the intestines, so long as fæcal ejections can be secured in never so small a quantity, the means to encourage them must be persevered in. No immediate operative measures should be sanctioned.

It is but rational to suppose, that in invagination of the intestine, operative interference holds out no prospect of relief, immediate or remote. The pathological conditions already discussed must satisfy the reader that such a conclusion is founded on substantial reasons. The common occurrence of invagination in early infancy; the frequent, often severe, peritoneal mischief which accompanies many cases; and the prospect of slough and separation of the invaginated portion, are the chief facts which strengthen the above conclusions. The following results are interesting: In *twenty-four cases* of intussusception, occurring at various periods of life, from two months and a half to fifty years of age, there died without any relief *thirteen cases*; some as early as three days, some as late as forty days, from the commencement of the symptoms. In the other *eleven cases*, the invaginated pieces of intestine sloughed and were passed by stool. Of these *eleven cases*, *two* died soon after the passage of the slough. *Nine cases* entirely recovered. The patients who recovered were ill for periods varying from five to thirty days respectively; their ages varied from six to fifty years.*

The injection of air or water into the rectum has been proposed and adopted in supposed cases of intussusception; nor can we say that such treatment has not been attended with advantage; for in well-authenticated cases with symptoms of invagination, this treatment appears to have done occasional good. The proof, however, is wanting, that actual invagination existed in such cases. This form of treatment cannot be supposed to possess any advantageous influence in the reduction of invagination of any extent or of some duration. The too indiscriminate employment of air, or of water, for the purpose of distending the bowel, with a view to reduce the prolapsus—to push it up, as it were—may act most injuriously; the peritonæum covering the intestine may be ruptured in consequence. But applied with discrimination, the use of warm water enemata alone is a measure which frequently will afford relief, temporary, if not permanent, in many conditions of constipation, and should be always had recourse to; not with an expectation that it will unravel an invaginated piece of gut, but that, if the diagnosis be incorrect and constipation depend on other and remediable causes, benefit may accrue, and perhaps recovery be insured thereby.

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* These particulars are taken from cases published by Mr. Hinton of Blaina, n an able article on 'Intestinal Obstructions,' in the *Association Med. Journal*, 853, p. 451.

In the treatment of all other forms of obstruction dependent on structural derangement or organic disease, medicines are of no avail. If the obstructing cause be not removed, or if the condition of the intestine be not relieved by some effective measures, the patient will surely die, and in a comparatively short time.

'Internal strangulation,' observes Rokitansky, 'when diagnosed, most imperatively requires an operative proceeding, for the purpose of disentangling and arranging the intestines, and for the division of the strangulating structures.'* Mr. Phillips, after careful study of the subject, arrived at the conclusion 'that the interference by surgical operation is justifiable when three or four days have passed without any relief from ordinary means (provided the constipation be complete, and vomiting of fæcal matter continue), because it affords a greater chance for the preservation of life than ordinary means.'†

Mr. Curling is of opinion 'that the success which has attended the operation of lumbar colotomy, in persons weakened by organic disease and want of nourishment, shows that the operation is not so formidable and dangerous as is commonly supposed.'‡

The alternative of cutting into the abdomen for the relief of obstruction must always be regarded as a choice of evils. This is the intrinsic worth of the operation. Nothing better can be said of it. On the one hand, a patient is suffering from the effects of internal displacement of intestine, which will surely destroy life in a very few days; or from a disease which will, by causing obstruction, certainly prove fatal in a few weeks, unless the displacement be set right, or the effects of the disease be obviated by an artificial outlet above the stricture.

It becomes manifest, when the anatomy of obstructions is fully considered, that one of two operations must be adopted, if relief is to be attained and life preserved; viz. cutting into the peritoneal sac, and endeavouring to remove the cause of strangulation; or cutting into the colon in either lumbar region without entering the cavity of the peritonæum.

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* *Path. Anat.* vol. ii. p. 54.

† *Med.-Chir. Trans.* vol. xxxi. p. 35.

‡ *British Med. Journal*, 1863, p. 111.

It is next a matter of importance to consider under what conditions either operation should be undertaken; in what manner each should be performed; and what should be the subsequent treatment of patients subject to such operations.

The operation of opening the abdomen through the peritonæum is requisite for the relief of internal strangulations of the small intestine, or obstructions caused by foreign bodies or calculi, or supposed strictures of the small intestine. That of opening the colon in the lumbar region can only be useful when obstruction occurs in the large bowel.

In internal strangulation dependent on any of the causes already referred to, an opening into the peritoneal sac should enable the surgeon to ascertain the cause of obstruction; or in many cases to divide the constricting band, or dislodge the intestine from the gripe of a fissure in the omentum.

The operation of opening the peritonæum will prove less successful under the following conditions: 1st, in cases of stricture of any portion of the small intestine; 2nd, in cases of obstruction from foreign bodies or calculi lodged in the intestine; 3rd, in cases in which peritonitis has set in from too long neglected strangulation.

The last condition alluded to indicates the importance of early interference. The formation of an artificial anus of the small intestine offers the only prospect of prolonging life. In the removal of a foreign body, provided the operation be recovered from, it may reasonably be anticipated that the artificial anus will close. In a case in which a portion of the ileum was strangulated by small intestine coiling round it, the peritoneal cavity was opened, the strictured part was relieved, and the patient recovered.*

The conditions which justify this operation are, a sudden attack of pain, followed by desire to be relieved, but with no action of the bowels, and persistent vomiting; and if little or no tenderness on pressure should exist, constipation must be complete, and must have exceeded a period of twenty-four hours, in company with all the above symptoms. It must be borne in mind that the amount and character of the pain are very important symptoms in these cases. If the strangulating orifice happens to be very small, or the band very tightly applied over the bowel, so that strangulation shall be very complete in the onset of the symptoms, it will be marked by great suffering, irresistible vomiting, great anxiety and restlessness, and complete constipation. Under such circumstances, delay in operation is dangerous. We cannot afford to wait, if we hope to secure ultimate relief; death will occur in three or four days, if some attempt be not made to remove the cause of obstruction, by opening the peritonæum.

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* *Prov. Med. and Surg. Journal,* June 11, 1851.

In strictures of the rectum, sigmoid flexure, or transverse colon, the operation for relief is confined to either lumbar region, from whence the intestine may be opened, where it is uncovered by peritonæum. The advisability of this operation can generally be fully weighed before it is necessary to perform it; for there is usually less urgency of symptoms in cases which require it than in strictures higher up; and often a period of a week or two may be permitted to elapse, provided the patient be carefully watched, before operation is absolutely requisite.

The conditions which demand it are, long continued and unyielding constipation, great distension of the abdomen, and commencing irritability of the stomach, or actual vomiting.

The conditions which forbid us to anticipate recovery, and therefore should withhold surgical interference, are, shrunken countenance, feeble and quick pulse, cold or clammy skin, and general tenderness of the abdomen, superadded to the symptoms enumerated above.

The operation of opening the peritonæum for the examination of strangulated or obstructed intestine, and for the formation of an artificial anus in the walls of the abdomen, was first advocated and adopted by M. Littre, in modern times at least: though the abdomen had been opened by Pillore of Rouen in 1776, and an artificial anus formed in the cæcum, for cancerous obstruction of the rectum.* The operation of M. Littre is thus described: 'Il faudrait faire une incision au ventre, et recoudre ensemble les deux parties après les avoir rouvertes, ou du moins faire venir la partie supérieure de l'intestin à la plaie du entre, que l'on ne refermerait jamais, et qui ferait la fonction l'anus.'*

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* 'On Artificial Anus,' *British and Foreign Medical Review*, vol. xviii. p. 452. The author begs to acknowledge the assistance he has received from the perusal of this most able essay.

This operation, originally proposed for the relief of imperorate anus, is that to which we can alone have recourse to elieve any form of internal strangulation, or obstruction deendent on mischief *confined to the small intestine.*

It is not desirable to adopt this operation in obstructions *onfined to the large intestine.* The operation which insures the pening of the ascending or descending colon, commonly ermed the operation of Amussat, is alone to be adopted in hese cases.

The operation for opening the peritoneal sac, to explore its ontents, requires but little to be said respecting the method of roceeding. The surgeon having decided upon the operation, hould have the patient placed on a conveniently high bed or able. The bladder should be emptied by a catheter. The ncision should commence an inch below the navel, and be arried down about four inches, or sufficiently low to allow of he obstruction being thoroughly investigated.

The first incision should extend down to the linea alba, which hould be next carefully cut through at one point, that the eritonæum may come into view. A broad director should now e passed under the conjoined aponeurosis, and the latter urther divided, so that the peritonæum be fully exposed. A mall opening must be carefully made through the latter, ufficient to allow the introduction of the first and second ngers. These being passed into the sac of the peritonæum ill serve the purpose of a director, and upon them a blunt-ointed bistoury can safely be introduced, in order to extend he incision in the peritonæum, either upwards or towards the ubes, as necessity or convenience direct.

When the abdomen is laid open, search must be made, lowly and carefully, for the constricted piece of intestine. The istended bowel may be followed down, if there is difficulty in t once arriving at the point of obstruction, until the cause of ischief is reached. It is impossible here to enumerate all the ifficulties which may now be encountered; it must be sufficient point out that bands of lymph or adhesions should be carelly separated, or divided; or the strangulated intestine withrawn from any loop or fissure in which it may have become entangled: or should a foreign body or calculus cause the stoppage, it should be removed by opening the intestine, subsequent artificial anus being the necessary result; for the edges of the wound of the bowel must be stitched to the margins of the external wound, and care taken that fæculent matter be not allowed to enter the peritoneal cavity.

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* *Hist. de l'Acad. des Sciences,* 1710, p. 36.

Except in the latter instance, the wound of the abdomen should at once be closed; the edges had best be drawn together with silver-wire sutures. The subsequent treatment of such an operation should consist of perfect rest and quiet; warm light applications to the abdomen; and opium administered by the mouth in one or two grain doses every four hours, as long as the patient does not sleep. Sleep should not be disturbed to administer a dose due: for sleep alone, in these cases, contraindicates the repetition of opium. Its internal use should be continued until the patient is quite restored to convalescence, and the motions are natural and regular; for the continued administration of opium to this period has been found not to hinder a natural and healthy action of the bowels. Its effects are most instrumental towards recovery.

When an obstruction is known to be situated in the rectum, or suspected in the sigmoid flexure, the descending colon must be opened; when suspected in the transverse or descending colon, the ascending colon, or cæcum, must be cut down upon. The exact seat of stricture may occasionally be ascertained—if in the rectum, by the introduction of a finger or a bougie; if in the sigmoid flexure, it is often made manifest by swelling, thickening, or hardness of the part. The stricture is less evident externally, when seated in other portions of the colon. It then often becomes mere speculation at which part of the bowel the obstruction is seated.

The chronic nature of the symptoms, the slow accumulation of fæces, point to the large gut as the seat of mischief; but whether the obstruction lie in the transverse or descending colon, it is generally impossible to decide. Under such circumstances, the only safe course would be to open the ascending colon.

The operation of opening the colon was first advocated by Callisen,* but attempted by him only on the descending colon. M. Amussat modified it by extending it to the ascending colon.

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* *Systema Chir. Hodiern.* tome xi. p. 842, Hafniæ, 1817.

But to M. Amussat is alone due the credit of having revived the operation—an operation not only fallen into disuse, but condemned as dangerous and impracticable by some very modern writers.

The virtue of this operation is, that it enables the surgeon to expose the intestine and open it, where it is uncovered by peritonæum, and where it lies in front of the quadratus lumborum muscle, and merely separated from that muscle by cellular tissue. The situation of the external incision, on either side, is in the lumbar region, between the last rib above, the crest of the ilium below, a vertical line running from the end of the rib to the crest of the ilium in front, and the edge of the longissimus dorsi behind. The colon in this space is fixed to the abdominal wall by the reflexions of the peritonæum, and lies loosely in contact with the quadratus lumborum. The kidney is situated rather above the seat of the incision. There is no meso-colon here; and if the colon be much distended, the cellular space between the folds of peritonæum will be very conspicuous. It is at this part that the intestine should be opened.

Callisen advocated a vertical incision for this purpose in the loin; Amussat has judiciously recommended a transverse one. The advantages are thus fairly stated: 1st, that it makes the operation easier and more certain, and avoids the danger of dividing the lumbar vessels and nerves; 2nd, that it facilitates finding and opening the intestine without wounding the peritonæum; and 3rd, it enables us to establish the artificial anus more anteriorly.*

The incision should commence in front of the longissimus dorsi, and be carried forwards to the extent of about six inches. The integuments having been divided, the muscles are to be carefully cut through until the intestine is exposed. This is not a difficult or troublesome proceeding. The intestine, especially if loaded, presents its muscular surface in the bottom of the wound, uncovered by peritonæum. The bowel should be at once hooked up by a curved needle; two or more points should then be secured by threads to the margins of the wound, and the gut opened. Usually a great gush of fluid fæculent matter takes place; ample provision should therefore be made to ecure it as it flows out, to prevent the bed becoming greatly soiled, which would be the case in a few seconds, if suitable basins be not at hand to apply to the edge of the wound.

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* Amussat's *First Memoir*, p. 241.

The intestine should be allowed to empty itself gradually. Usually the relief to the patient is at once very considerable; but he should be steadily watched, and well supported, as faintness is very apt to follow upon the rapid evacuation of the long distended bowel; or should peritonitis have set in prior to the operation, the patient will soon sink.

Should the patient survive the operation, the treatment of the wound is of next importance. In the first instance much inconvenience and even some distress may be experienced from prolapse of the gut through the artificial opening; especially if the latter be a free one.

But as the wound in the integuments has a natural tendency to contract as time advances, and the margins of the intestinal opening become adherent to the former, the prolapse will gradually diminish in proportion to the contraction, and will usually cease ultimately when the orifice becomes fully contracted. Indeed, should the patient's life be prolonged, it will be found as a rule, that the surgeon's attention must be directed towards maintaining the freedom of the artificial opening sufficiently to insure the escape of the contents of the bowel. In the first instance the escape of fæcal matter through the wound may be controlled by the use of an ivory ball or plug attached to a small shield, on which a piece of india-rubber sheeting may be placed, and fixed in its position by a bandage. As the wound continues to contract, it will be found best to substitute for the ivory plug a piece of sponge-tent: this may be introduced and worn in the opening day and night, but changed morning and evening. Its use has been found to effectually control the escape of air and fæcal matter.

Sometimes the patient will experience discomfort from the accumulation of fæces between the strictured portion of the bowel and the artificial opening; or from the contents of the bowels becoming too solid to pass freely through the aperture, and therefore care must be taken to regulate the action of the bowels with gentle aperients as circumstances indicate.

The operation of opening the colon in the lumbar region is an important measure, not only for the prolongation of life in cases of total obstruction from stricture of the rectum; but also for the mitigation of suffering in cases of ulceration and stricture of the rectum without actual obstruction. In such cases cruciating pain is often experienced, when the bowels act, m the passage of fæcal matter over the ulcerated surface; d it has been found that by establishing an artificial opening ove the seat of disease, and thus diverting the passage of ces, and leaving the stricture at rest, great comfort has been nferred upon the sufferer.

Mr. Curling was the first to advocate this operation under ch circumstances, and he has frequently adopted it with uch relief to the patient's sufferings while life lasted. He commends previous to the operation that the bowel should be jected with fluid in order to distend it to some extent, as hen in a distended condition, the bowel is more readily tected and secured than when empty and contracted.

Mr. Holmes* has published the particulars of a case in which he opened the scending colon for the relief of a patient in whom there was a fistulous comunication between the sigmoid flexure of the colon and the bladder. The mptoms were immediately relieved, and the patient remained free from the ssage of fæcal matter into the bladder for about fifteen months, when fæces ain appeared in the urine. He shortly after this, died; and on post-mortem amination it was found that besides the communication between the sigmoid xure and the bladder, there had formed a more recent communication between e bladder and the cæcum.

Mr. Curling has either himself performed or recommended the operation of pening the descending colon in seventeen cases of diseased rectum, or obstruction of the bowels. In ten of these cases the patients survived over periods arying from two to eighteen months. In a case under the care of the author, nd in which complete obstruction had existed nearly three weeks, the patient as survived the operation over two years and a half. The artificial opening as always shown a tendency to close, but has been kept open by the use of ponge-tent. For some time past a portion of the fæces has passed the natural ay.

The Operation of Tapping; Paracentesis Abdominis.

When the abdomen becomes inconveniently distended with luid, contained either in the peritoneal sac or in an ovarian yst, it is desirable to relieve the patient by tapping the cavity n which the fluid is lodged.

Previous to the operation, the patient may be placed upright n the edge of a chair, or recumbent on the side of a bed. A road towel, warmed, should be passed round and above the mbilicus, and a second one below; the ends of these towels eing held behind the patient, to be tightened as the fluid escapes from the abdominal cavity, in order that a certain amount of support be afforded to the viscera when the whole of the fluid is abstracted. Previous to the introduction of the trocar, it should be ascertained that the bladder is not distended with urine. A small incision should first be made through the skin, about two or three inches below the umbilicus, just sufficient to permit the passage of the cutting surfaces of the trocar without injury to the skin. This proceeding allows the trocar to be passed readily into the abdomen, and is less painful than if the trocar is thrust through the integument. The trocar should be pushed nearly up to the hilt of the canula, and the stilette then withdrawn, care being taken that the canula does not slip out after it. The fluid will now escape freely if serous in character, and the cavity will soon be emptied.

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* *Trans. Med.-Chir. Soc.* vols. xlix. and l.

If the patient become faint during the flow of the fluid, a finger may be applied to the orifice of the canula to arrest the escape, while some stimulant is administered, and until faintness passes off. The common trocar, with short canula, is the simplest implement to use in this operation, and as efficacious as any; but of late a tube of india-rubber has been adapted to the canula, so that the fluid may be carried to a basin at the foot of the chair or bed which supports the patient. The choice of the instrument is a matter of fancy; the original and most simple trocar is as efficacious and as convenient as the most modern complicated one.

It sometimes happens, that after a certain quantity of fluid has escaped, the flow suddenly ceases, while there is still much remaining in the cavity; this is occasioned, probably, by intestine or some other substance coming in contact with the inner extremity of the canula; the obstruction may be remedied by either moving the position of the canula, or introducing the blunt-pointed but perforated tube, with which each case of trocars should always be provided.

The large accumulation of fluid in the cavity of the peritonæum, or in an ovarian cyst, usually pushes the anterior abdominal wall so far forward that a considerable interval intervenes between it and the surface of the intestines; so that when the trocar is introduced, there is little risk of wounding the bowels. This is, however, an accident which occasionally happens, and therefore it behoves the surgeon to make a very careful examination of the surface of the abdomen, before proceeding to operate; if any tympanitic resonance be detected near the umbilicus, or below it, the operation had better be postponed or avoided. Mr. Gay exhibited, at the Pathological Society, a specimen of a portion of the jejunum, which had been punctured in the operation of tapping, in a case of ascites; but the patient survived the accident, and died three months afterwards, apparently from the disease which produced the ascites.* The wound caused by the trocar should be dressed with lint and plaster, and a bandage applied over it, round the belly. In a few days the parts have usually healed.

GEORGE POLLOCK.

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* *Pathological Trans.* vol. ii. p. 203.

HERNIA.

PART I.

Pathology and Treatment of Hernia in General.

AN escape of any viscus from the cavity in which it naturally placed is termed a hernia; but the observati in this essay are exclusively restricted to protrusions of abdominal viscera. In common language this disease is cal rupture. Our object will therefore be to describe the variet of hernia developed in the different regions of the abdom their pathology and treatment.

The whole subject is divided into two parts.

The first embraces general considerations in relation to statistics, pathology, and treatment of the disease.

The second is devoted to an examination of the spec regional varieties of hernia, their anatomical characteristi etiology, diagnosis, prognosis, and the treatment especia adapted to each kind.

Sex.—Both sexes are afflicted with hernial protrusions. Af carefully considering the statements of writers in relation to numerical proportion in which the two sexes are subject hernia, we must admit that we have not the requisite data enable us to arrive at any satisfactory conclusion. We m however, broadly state the fact, that hernia occurs m frequently in males than females. Out of a gross total 96,886 applicants for trusses at the City of London Tr Society, the males were 78,394, the females 18,492. Afte careful consideration of all the circumstances, Mr. Kingd estimates the proportion at two males to one female, for all a and including every variety of hernia.*

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* The proportion between males and females varies considerably at differ periods of life, on account of causes connected with certain congenital malforn tions, which will be spoken of in treating of the special forms of hernia. Th

Frequency of hernia at different ages.—The only trustworthy facts relating to the various ages at which hernial protrusions are first developed, have been collected by Mr. Kingdon. In the reports of the City of London Truss Society for the years 1860 and 1861, he has tabulated 9,296 cases of inguinal and femoral hernia. All these patients passed under his personal examination, and the respective age of each individual when the hernia developed itself was ascertained as accurately as possible, by reckoning back to the age at which it was first noticed. Observers have been before this occupied in attempts to ascertain the ages when protrusions most frequently occur; but they have uniformly noted the ages of the persons at the time of their appearance before them. Accurate data were, under these conditions, never obtained; that is, if a knowledge of the age at which hernia is developed is to be regarded as a desideratum. Hence M. Malgaigne makes it appear that there are fewer cases of hernia before thirty-five years of age than after. This is a fundamental error, unless national peculiarities

TABLE A.

Showing the ages of the patients when the hernia was first noticed.

Age.	1860.				1861.				Kingdon's Tables—Report of Truss Society, 1861–62. Age at development.	
	Inguinal.		Femoral.		Inguinal.		Femoral.			
	M.	F.	M.	F.	M.	F.	M.	F.		
under 1 yr.	473	27			563	37			1100	1764
1 to 5	181	17			192	26			416	
6 ,, 10	91	23	3	1	112	16	2		248	
11 ,, 15	115	19	4	2	133	19	3	6	301	981
6 ,, 20	284	27	3	14	291	38	8	15	680	
,, 25	348	30	18	31	375	33	13	37	885	1938
,, 30	381	45	21	58	424	50	20	54	1053	
,, 35	334	48	19	55	399	37	14	70	976	1909
,, 40	320	38	18	59	373	41	16	68	933	
,, 45	271	31	30	47	268	24	11	49	731	1377
,, 50	258	11	18	32	272	10	15	30	646	
,, 55	167	12	12	26	224	11	11	27	490	846
,, 60	147	6	9	16	151	4	8	15	356	
,, 65	97	6	10	11	110	3	7	12	256	379
,, 70	59	5	8	2	44	1	1	3	123	
,, 95	32	1	1	1	54	3	3	7	102	
	3558	346	174	355	3985	353	132	393	9296	

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in Mr. Kingdon's statistics for 1860 and 1861, there were in the first five years of life 1,409 males, and only 107 females; while in the five years from 25 to 30 years of age, the proportion had changed to 846 males against 207 females.

produce different results. The truth is, taking all varieties of hernia in both sexes, that the majority of cases are developed before thirty-five years of age.* I believe in the correctness of this fact, after having tested its accuracy as far as my means allow. It is, I know, directly in opposition to the received dogmas; but as we advance we shall be able to assign very good reasons why hernia is so much more common before middle life than after that period.

Frequency of hernia in relation to population.—We have no trustworthy data on this subject. The general statements which have been advanced, in some of which the proportion is put as high as one in eight of the male inhabitants of the whole kingdom, and even one in five of the whole population of one district, do not rest on any precise information, and appear exaggerated.

Frequency of hernia in relation to age.—Mr. Kingdon's statistics (Table A) show that out of 9,296 applicants for trusses, 1,516 were under five years of age. This would appear at first sight to show a much greater prevalence of hernia in infancy than during any other period of life. But this disproportion vanishes when we take into consideration the number of infants out of any given population. Thus, if we take Mr. Kingdon's table as giving an accurate idea of the numerical prevalence of hernia at different ages in London, we must compare the ratio between the number of cases of hernia at any given age and the total number of cases of hernia, with the ratio between the number of the population living at that age and the total population. Proceeding in this manner, we shall find that while there is no exact proportion maintained, yet the frequency of hernia slightly advances towards the latter end of life. Thus, taking the census of 1851, the total population of London of both sexes at all ages was 2,362,236; out of these, 293,562 were under 5 years of age: a ratio of 1 to 8·004. Out of the 9,296 which form Mr. Kingdon's total, 1,516 were under 5 years of age,—a ratio of 1 to 6·13. Taking the next decade, we find the total number of the population between 5 and 10 to be 243,648, or in a ratio of 1 to 9·69 to the total population; the number of cases of hernia, however, is only 248, or in the ratio of 1 to 37·08 to the total number of cases of hernia. Again, it was shown above that the absolute number of cases of hernia developed under 35 years of age was greater than that of those developed above that age, the proportion in Mr. Kingdon's table being 61 to 39. But in the census table the proportion of persons alive under 35 to those above that age is still higher, viz. 69 to 31. Therefore hernia is more common relatively to the number of the population above the age of 35 than under that age. It appears from calculation on these data, that 41 per cent. of cases of hernia are developed under the age of 35, and 59 per cent. over it.

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* The following statements show the number of cases of hernia occurring at different ages, when the age of each patient was recorded by M. Malgaigne, at the time each one came under his observation; and when the respective ages were carefully ascertained by Mr. Kingdon, to show when the hernia was first noticed. Out of 2,343 cases recorded by M. Malgaigne (*L'Union médicale*, 1854, p. 53), 555, or 23·6 per cent., were under 35 years of age; 1,788, or 76·4 per cent., above that age. On the contrary, out of 9,296 cases recorded by Mr. Kingdon, 5,659, or 60·8 per cent., had commenced before 35 years of age; and 3,637, or 39·2 per cent., after that age.

As the two tables exhibit such different results, I wrote to M. Malgaigne, who kindly returned the following polite reply:

'Mon cher confrère,—La réponse à votre question:—les âges marqués à la page 53 (de *L'Union méd.*, vol. viii., 1854) sont ceux des malades au moment où ils venaient à la visite du bureau central.'

The relative proportions of the different kinds of hernia at various ages and in both sexes, together with explanations of their occurrence, based upon anatomical and physiological facts, will be found in other parts of this essay.

The influence of occupations on the formation of hernia.—All persons, in every station of life, are liable to hernia. By far the majority of cases occur among the labouring class, which, abounding as it does in all large towns, affords a favourable opportunity to ascertain whether the pursuit of any particular trade or occupation involves a greater liability to hernia than another.

Mr. Kingdon has inquired into this subject with his usual care, and the results of the investigation are printed in the Report of the City of London Truss Society.[*] He has produced a table in order to compare the twenty-five largest classes of occupation, arranged in the order of their magnitude from the census of 1851, with the numbers of each class who applied to the Society during three successive years. This 'indicates that the patients who seek relief on account of hernia bear a direct proportion to the numerical magnitude of the classes to which they respectively belong, and not to the severity of the toil.'

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[*] *Report*, 1861, p. 11.

The influence of hereditary conformation predisposing to the development of hernia.—A disposition to hernia may be inherited; that is, the children of ruptured parents are frequently afflicted in like manner. Mr. Kingdon has taken great pains to ascertain the proportion of cases in which this hereditary influence exists. In the reports of the City of London Truss Society for 1860–61, he has published the result of his inquiries. Both sexes show an equal tendency to be thus influenced. The proportion, by calculation, seems to be about 34 per cent. Thi hereditary predisposition, paternal, maternal, or on both sides is manifested in the most marked degree with infants und one year; the cases being about 12 per cent. of the whol number in the first twelve months of life.

This fact points to two very important causes which gi rise to hernial protrusions at this early age: first, to th arrested efforts of nature in closing the ventral orifice of th vaginal process of the peritonæum, and the obliteration of th sheath; and, secondly, to an abnormal elongation of the m sentery. Those two structural conditions belong to a class anomalies very likely to be determined by hereditary infl ences.

Congenital defects of the parietes of the abdomen have be already mentioned as predisposing causes of hernia, and th subject will be further dwelt upon in discussing its vario forms. Wounds, inflammatory lesions of the abdominal wal and other predisposing causes may be mentioned. It is question, whether a portion of small intestine can reach t fundus of the scrotum, unless its mesenteric ligament be preternatural length. For it is difficult to understand h the upper portion of the small intestine or the cæcum c descend so low as they are sometimes seen, without at the sa time their mesenteric folds being elongated. But the fact to accurately ascertained is, whether the mesentery is abnormal long antecedent to the descent of the hernia; whether, in trut a morbid elongation of the mesentery be a primary cause hernia or not. Doubtless this structure becomes lengthen and stretched as the result of repeated or continued descents the intestine; but we are not cognisant of any facts to prove congenital condition of the kind above alluded to. At fir sight, this circumstance regarding the elongation of the mese tery may seem to have very slight practical value. Upon reflection, however, we shall arrive at an opposite conclusion. It has a very important bearing on the question of the radical cure of hernia, as it is termed. For if it be proved that the primary cause of any viscus protruding from the abdominal cavity can be traced to a morbid condition of its peritoneal retaining ligaments, the mere obliteration of the hernial sac can avail but little in producing the intended result of affording permanent immunity from the disease. That which often happens when a truss is used to support one kind of hernia would occur in this case also, namely, the development of another, perhaps even on the opposite side of the body; and thus any operation, even if successful in obliterating the first sac, would be of little value.

Persons in whom a hernial sac exists certainly state, that they are more troubled with the descent of a hernia if they get out of health. This circumstance leads to the inference, that when the tissues generally are weakened and relaxed by indisposition, those which should maintain the viscus in its proper situation, participate in the general morbid condition, and then permit the hernia to escape more readily.

It is equally certain, too, that persons constitutionally of a weak frame of body, whose contractile and fibrous tissues are deficient in tone and power, become more commonly subject to the development of a hernial sac as age advances, than those of an opposite conformation; always, of course, excepting those persons who have a congenitally open vaginal process of the peritonæum.

And further we may state, as the result of actual observation, that in both males and females of middle age the subject of hernia, the heavy abdominal viscera, the solid glands for example, are usually disposed in a much lower situation than their normal one; that, in fact, the abdominal viscera generally are not so firmly held in their proper places by their peritoneal ligaments as when no disposition to hernia is shown.

Between the muscular walls of the abdomen and the contents of that cavity a constant antagonism exists. The gaseous and fluid distension of the intestinal tube exerts an ever variable pressure against the abdominal walls, whilst they, in their turn, react upon the inflated viscera; thus between these opposing forces a sort of equilibrium is maintained. The balance between them is, however, sometimes destroyed, and the parietes are no longer able to restrain the viscera within their normal limits.

Thus hernia is often associated with a great increase in th
bulk of the viscera, from the rapid development of fat in th
omentum and mesentery. A persistent laxity of the pariet
peritonæum likewise, subsequent to distension of that membra
occasioned by the gravid uterus, is a morbid condition whi
renders it liable to pass readily out of the abdomen, under t
influence of any pressure from within, through the weak poi
of the walls, and it must also be reckoned among the pred
posing causes of hernia.

The immediate cause of a hernia is certainly, in some cases,
be traced to a sudden and forcible diminution in the capa
of the abdominal cavity, the result of compression or contract
of its walls; in other words, the combined actions of the ab
minal muscles, coincident with strained attitudes and postu
of the body during the effort of violent muscular exertion ge
rally, give rise to the sudden development of a hernia.
cannot, perhaps, accept as truth the statement of all the r
tured men who attribute their affliction to muscular exerti
but all surgeons who have had much hospital experience wil
able to call to mind cases depending upon this cause.

A large proportion of the cases of hernia are undoubtedl
gradual development. In many of these, however, violent m
cular contraction doubtless plays an active part. How o
we observe hernial tumours in patients afflicted with dysu
Is not hernia very liable to occur in persons labouring u
bronchitis of one form or another? And although it mus
admitted that more or less laxity and loss of restraining p
in the tissues of these persons exist with regard both to
fibrous walls of the abdomen and the peritoneal ligaments of
viscera, yet this effective agent, muscular contraction, exert
powers with less restraint and limit, and thus presses the
cera away from their normal situation.

The hernia consists of a part only of any of the abdom
viscera. Such of them as are permitted, by their perito
attachments, to change their relative situation within the a
minal cavity with the greatest freedom, most frequently es
or protrude through its walls. Thus portions of the s
intestines and omentum form the contents of the hernial
in the majority of cases, although a part of every abdom
viscus has been occasionally found therein.

Semeiology.—The signs which denote a rupture are mor less marked according to its volume, its condition, the viscus composing it, and the thickness of the tissues by which it is covered. The patient complains of 'a weakness' in the region in which a hernia commonly occurs; and this is often the first symptom which indicates a tendency to a protrusion in the adult. The inguinal region, especially in a male adult who makes a complaint of this kind, shows a remarkable fulness at the site of the internal abdominal ring, and often along the whole track of the region of the abdominal walls termed the inguinal canal, if carefully examined. From a similar appearance, a tendency to hernia may be detected in the weakly and delicate adult female at the crural aperture. In both cases the fulness becomes much more distinct if the patient maintains the erect posture and forcibly contracts the abdominal muscles.

Next, a small swelling or 'lump' is felt, which is not permanent, but disappears under slight pressure or on assuming the recumbent posture. It reappears when the pressure is removed or on standing erect, and it becomes more prominent when the abdominal muscles are put into strong action by coughing or some voluntary effort.

In infants and children the tumour produced by a hernia is often of considerable size when noticed for the first time; but it soon diminishes if the swelling be pressed, or the recumbent posture imposed. In youthful adults also a hernia is often developed suddenly, generally in the inguinal region or scrotum. This, happening under the influence of violent muscular exertion or forcible compression of the abdominal walls, is usually attended with more or less pain.*

The structure of the viscus which forms the hernia also modifies its signs and indications: thus, if the protrusion be solid, as when omentum escapes (epiplocele), the hernial swelling will be hard, resisting, and lobulated; if the protrusion be hollow, as in hernia of intestine (enterocele), the swelling will be yielding, soft, elastic; and if the contents be gaseous and fluid, it will yield a dull sound on gentle percussion, or a peculiar gurgling is heard at the time the rupture is handled.

Some swellings formed in those regions where hernial protrusions commonly occur closely resemble that disease; but as they are liable to simulate some special kind of hernia, their differential diagnosis is given in other parts of this essay.

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* In a manuscript lent to me by Mr. Kingdon, he shows that, out of 706 adult males, only 48 pretended to assign any cause for the protrusion; but I find that the majority of the men in whom the inguinal hernia was suddenly developed were youthful adults.

Prognosis.—By ordinary care and precaution, a person the subject of hernia is not in great danger of those accidents affecting it which imperil life. On the contrary, however, by neglecting to employ a bandage to prevent the escape of the hernia, or by making use of an instrument which fails to effect the purpose intended, namely, the complete retention of the hernia within the abdomen, the life of the individual is perpetually in jeopardy from the liability to inflammation or strangulation of the protruded viscus.

In proportion, then, as the palliative measures directed by the surgeon are carefully employed by the patient, the prognosis in any case of reducible hernia may be regarded as favourable, or the converse.

If the hernia be a small reducible enterocele, a truss may be used, which will prevent its descent for months, or even years. If the case be one of irreducible epiplocele, complicated with the occasional descent of small intestine, the prognosis must be regarded as relatively unfavourable, in consequence of the great difficulty in preventing the entrance of the bowel at the orifice of the sac, where it may become strangulated without any premonitory symptoms.

Nomenclature of herniæ.—The varieties of abdominal herniæ are named from the period of life at which the hernial sac is formed; the region in which the protrusion takes place or exists; as well as from the viscus which composes the tumour.

When named from the viscus forming the protrusion, a hernia is styled intestinal when any portion of the alimentary canal escapes. This is also termed an enterocele.

If a portion of omentum protrude, the expression omental hernia, or epiplocele, signifies its nature.

A combination of these two is called an entero-epiplocele.

The terms gastrocele, cystocele, have been applied to protrusions of the stomach or bladder from the abdomen.

The classification of hernia according to the regions in whic it occurs is given in the second part of this essay.

The essential parts of a hernial tumour.—When an anatomi dissects a tumour caused by the protrusion or escape of a viscus from the cavity or region in which it is naturally co ned, his observation should be especially directed to three ncipal objects. These are:

. *The tissues outside the sac*, or the ordinary structures of the region in which the hernia is developed;
. *The sac*; containing
. *The hernia* itself, or the protruded viscera.

Under these three sections we shall describe the essential elents of a hernial tumour: first, in the condition in which y commonly exist, when the only source of trouble depends on the mere tendency to the protrusion of the hernia; and, ondly, under those morbid conditions which affect certain rts of the sac; the contents of the sac, the real hernia; and e tissues outside the sac. Upon the judicious surgical treatnt of these morbid conditions the salvation of life depends.

The inciting causes of hernia.—Protrusions of the abdominal scera are the result of—

1. Wounds or lacerations of the abdominal walls;
2. The weakening or destruction of the same parts by inflammatory processes;
3. The existence at birth, and persistence afterwards, of a canal which is a prolongation of the peritonæum; and,
4. The gradual expulsion of the parietal peritoneal membrane at weak parts of the abdominal walls, forming a pouch or receptacle for portions of the viscera.

1. In this essay I am not required to describe those of the st class, which depend on wounds, such cases having been ated of under the head of INJURIES OF THE ABDOMEN.

Hernia, however, occasionally occurs in the inguinal region, the result of the application of direct violence in its vicinity, ithout any wound of the integuments.

2. *The weakening or destruction of the abdominal parietes* om the effects of inflammation and its results give rise to the condary occurrence of hernia. Thus, after the healing of bscesses in those parts, it is not very uncommon to see a herial tumour developed at the site of the primary disease. It is nportant, therefore, as a prophylactic measure, to support the bdominal region by means of a suitable bandage during the ealing of such abscesses, and for some time after cicatrisation.

3. *Congenital patency of the vaginal process of the peritonæum.*—We must now consider that congenital condition of the peritonæum which allows a portion of the abdominal viscera to escape from its natural cavity and occupy an abnormal position in its immediate vicinity.

Towards the close of the last century, and at the commencement of this one, anatomists were very much interested in observing the changes in the situation of the testicles during the period of fœtal life. Accurate observation established the fact, that the development of the testicles commenced in the lumbar regions of the fœtus in utero, and that when those organs had reached a certain stage of perfection, they migrated from their primary locality, and, pursuing a course towards the pelvis, they at last reached the scrotum, the final point of their destination. In this progress, termed the 'descent of the testicles,' and whilst they are within the abdomen, they are placed behind the peritonæum, and partially invested by it. A prolongation from this serous membrane accompanies them into the scrotum, and receives the name of the vaginal process of the peritonæum.

Thus wrote Wrisberg in the year 1800: 'Testis semel in scrotum delapsus pluribus cingitur velamentis. Tria esse membranarum genera, quæ id præstant, Tunica vaginalis communis pro teste, epididymide et funiculo spermatico simul; Tunica vaginalis propria vasorum spermaticorum; et Tunica vaginalis similiter testi et epididymidi propria; cuilibet in arte anatomica tironi nunc cognitum est.' *

A direct and uninterrupted communication exists between the cavity of the peritonæum and the interior of this sheath; so perfect, indeed, that the more movable abdominal viscera can pass, without impediment, from the one into the other. The line of demarcation between these cavities corresponds to, or is in relation with, that arrangement of the internal abdominal fascia termed the internal inguinal ring: and, adherent to the posterior surface of the vaginal process, near its inferior termination, is placed the testicle.

In early fœtal life, and, in many instances, for a month or even a longer period after birth, this tubular process of the eritonæum extends into the scrotum. It lies in front of the permatic cord and testicle; extends from the internal inguinal ing to the lowest end of that gland; and forms a membranous, ylindrical canal until it reaches the testis, when it expands nto an elliptical cul-de-sac. Before birth, or soon after, this aginal process of the peritonæum is divided into two portions— superior and inferior. The sheath contracts near the head of he epididymis, its surfaces adhere firmly at that spot, and thus wo cavities are formed. The inferior one is termed the tunica aginalis propria testis: for it is in immediate relation with a arge portion of the surface of the testicle. The superior canal, ermed the tunica vaginalis propria funiculi, lies in front of the spermatic cord.

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* H. A. Wrisbergii, *Commentationum Med. &c. Soc. Reg. Scient. Gottingensi oblatarum et editarum*, vol. i. p. 179, § 5.

When these parts are in a normal condition, the inferior cavity or vaginal covering peculiar to the testis remains throughout life as a closed serous sac, and contains a little serum. Under similar conditions the superior canal or vaginal covering peculiar to the spermatic cord is entirely obliterated. Its superior abdominal or ventral orifice is permanently closed; and although a trace of the existence of this canal is sometimes observable in adult life, it is merely a delicate fibrous cord, the ruinæ processus vaginalis peritonei. Occasionally, although very rarely, a fine membranous canal remains throughout a long life sufficiently large to admit an ordinary sized probe. In the account of the post-mortem examination of Sir Astley Cooper, it is stated that 'a minute serous canal, not more than a line in breadth when opened, was traced, extending from' a depression at the right internal abdominal ring 'along the spermatic cord, into the cavity of the tunica vaginalis.' *

Sir Astley Cooper himself writes: 'I dissected a boy, six years of age, in whom the opening of the tunica vaginalis (vaginal process of the peritonæum) was still so large that I could pass a female catheter through it down to the testis.' And further on, in the same chapter, he relates a case of 'sudden descent of a hernia into a congenital vaginal process of the peritonæum, of the nature above described, in the person of a young man whilst in the act of lifting a sugar-cask.' † Several instances of a similar kind have come under the observation of the author of this essay.

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* *Guy's Hosp. Reports*, 1841, vol. vi. p. 232.

† *The Anat. and Surg. Treatment of Abdom. Hernia*, 2d edit. chap. xvii.

Of the changes which take place in the vaginal process of the peritonæum.—Several distinguished anatomists have traced the changes which occur in this serous sheath to render its obliteration perfect. Without producing a literal translation of the writings of Seiler, I believe it will be interesting as well as useful to the reader to quote the substance of his observations.*

When the testis has reached the bottom of the scrotum, the inguinal canal, along which the cord passes, is still very short, scarcely one and a half to two lines long. In the fourth and fifth month the internal inguinal ring lies almost directly behind the external. The inguinal canal is developed in the later months, and soon after birth it is always longer. The spermatic cord now consists of the blood-vessels, vas deferens, nerves, and the vaginal canal, at the termination of which lies the testis and the larger part of the epididymis.

After the testicle has reached the fundus of the scrotum, the obliteration of the vaginal canal proceeds from the inguinal rings downwards to the superior border of the testis, so that only the proper vaginal membrane of the testis remains, as a rudiment of the vaginal canal—the tunica vaginalis propria testis. The time at which the closure of its ventral orifice takes place and the obliteration of the canal is completed cannot be well defined. It is usually closed, at least on one side, and generally at the upper part, from the internal inguinal ring to the centre or middle of the spermatic cord, even before the whole vaginal canal has contracted, especially that portion which is embraced by the internal inguinal ring. The first stage of the obliteration of this canal commences with this process.

In the second stage, the walls of the vaginal sheath unite together entirely, as far as the superior end of the testis; or it first closes in the neighbourhood of the testis, so that the centre part still remains open.

The third stage is accomplished when the canal is partially or entirely closed. This portion of serous membrane is converted into a flat band, which afterwards becomes connective tissue, but which is rather closer and finer than the rest of the same tissue of the spermatic cord.

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* Anton Scarpa's *Neue Abhandlungen ü. d. Schenkel- u. Mittelfleischbrüche &c.*, *bearbeitet mit einer Anleitung zu der Zergliederung d. Leistengegend &c. Kupfertafeln* von B. W. Seiler, vol. ii. p. 374, &c. Leipzig, 1822.

As the fourth stage, this stripe of connective tissue always becomes thinner, and at last entirely disappears; or there remains behind only a slight trace of it below, above, or in the centre.

State of the vaginal process of the peritonæum at birth.—In the majority of new-born infants some portion of the vaginal canal still remains. In 21 Seiler found 4 in which it was open on both sides; 5 in which it was open on the right side; 4 on the left; and of these 13, 5 in which the abdominal aperture continued open on either one side or the other. In 5 of the 21 infants the canal was closed above and below, but in the centre open; in 3 the inferior part was closed, but in the upper part, from the internal abdominal ring, a portion remained wide open. Likewise, in other examinations, he found the inferior part unclosed towards the middle of the spermatic cord, or even as far as the internal abdominal ring; more rarely the centre was open, and still more rarely the upper part only.

Camper found, in 53 new-born infants, 23 in which the canal was not closed on both sides; 11 in which it was open on the right side; 6 on the left.

Schreger found the following relations: in 13 new-born infants, the canal was open on both sides in 8; in 6 in its centre part between the abdominal orifice and the testis; in 2 in its whole length, in which also the abdominal orifice of the right side still remained open. In the remaining 5 it was open between the abdominal fold and the testis, but only on the right side.

Paletta states that, as a rule, the complete closure of the vaginal canal takes place from the twentieth to the thirtieth day after birth.

I have myself dissected numerous fœtuses of full age, and have been surprised to find in what a large majority of them this canal continued patulous either on one side or both sides.

With a knowledge of these anatomical facts, we can readily understand how it happens that a canal or receptacle exists at birth into which a portion of the intestines may enter. When this takes place, the hernia of infancy exists. It is a circumstance of very common occurrence to see an infant soon after birth with an enlargement of the scrotum, which varies in size, and sometimes disappears altogether. It attains its largest dimensions when the infant exerts its abdominal muscles; it slowly decreases and is lost sight of during repose, the recumbent posture, or in sleep. This tumour of the scrotum is due to a hernia of small intestine which escapes from the abdominal cavity into the prolongation from the great serous peritoneal membrane, known by the name of the vaginal process of the peritonæum. This serous sheath, which, from its structure, allows of considerable distension, is thus converted into a hernial sac. The attention of pathologists was first drawn to this fact by Haller in 1749. His observations were confirmed, and the nature of the disease was still further elucidated, by John Hunter and Percival Pott. Haller employed the term hernia congenita to express that variety in which the intestine and the testis touch each other, or are contained in the same sac; and by this name the disease has been distinguished since the date of his publication. It is, however, a most inappropriate term, inasmuch as the hernia does not exist either during intra-uterine life or at birth. A congenital imperfection, it is true, allows the descent of a hernia soon after birth; and therefore M. Malgaigne calls it the 'hernia of infancy.' But even this term is not sufficiently definite. I prefer the designation, hernia into the vaginal process of the peritonæum.

4. *Of the slow and gradual development of the hernial sac.*—The peritoneal membrane is capable of very great but gradual extension. This capacity is illustrated by cases of serous dropsies and of ovarian growths. In the same manner as the whole membrane yields to the general pressure of accumulating fluid, so it dilates under the influence of local pressure into a diverticulum, or sac, until it is sufficiently capacious to contain a very large part of the alimentary canal. This condition we see in those cases of enormous double scrotal hernia, which reach sometimes even below the knees.

Every hernial sac is composed of a body, or central part, above which is the neck, and below the fundus. The mouth, orifice, abdominal or ventral aperture (*le collet* of the French), is the point of immediate communication with the cavity of the peritonæum. To the tissues forming the margins or boundaries of this opening particular attention must be directed. These constitute, by their rigidity and unyielding texture, the principal impediment to the reduction of the hernia, in most cases; and it is, therefore, this part of the sac which requires to be cut in order to replace the protruded viscus within the abdominal cavity, when the reduction cannot be effected without opening the peritoneal sac.

The development of the hernial sac.—The evolution of the slowly-formed hernial sac has been very completely traced and described by Drs. Jules Cloquet[*] and Demeaux.[†] I shall here quote as briefly as possible the chief facts related by the last-named pathologist.

When the peritonæum, depressed by the pressure of the abdominal viscera, traverses the walls of the abdomen, it presents, at first, the shape of a digital depression; then, of a funnel; and next, that of a finger of a glove. These forms are, however, somewhat dependent upon the region in which the hernia is developed. During this period the entrance to the hernial sac is larger than the fundus, and in these conditions a strangulation of the herniated viscus cannot take place. But when the fundus of the sac has reached those tissues which offer less resistance, it dilates, becomes rounded, and assumes a spherical shape; in this condition the entrance is more contracted than the fundus, and under these conditions strangulation may occur.

There are three periods or states in which the orifice and neck of the sac should be examined: 1st, of their formation; 2nd, of their organisation; and 3rd, of their contraction.

The first period of formation.—It is important to describe the mode of formation of the mouth of the sac, since, from certain facts, conclusions which are useful in practice may be deduced. In the formation of the hernial sac it is demonstrable that the displacement of the peritonæum is a condition of more import than the stretching of the membrane.

When the hernial sac is complete, the portion of peritonæum employed to form it may be represented by a plain membrane about three inches in diameter and ten in circumference; whilst the centre of this surface is placed at the fundus of the sac at the most dilated part, the periphery, folded and puckered like the mouth of a closed purse, would be placed on a level with the opening at the narrowest part; that is to say, at the orifice of the sac, supported by the ring or the canal which the hernia has traversed. This puckering has been described by all authors, and in the plates of Jules Cloquet and Langenbeck the fact is delineated. It is also attested by preparations in almost all pathological museums. During this first period, the orifice and neck of the sac exist only in a condition to be preserved by a fibrous or muscular ring, which prevents the dilatation of the peritonæum; if this is returned into the abdomen by any mechanical means, the puckering disappears, and the orifice of the sac is effaced. If the fibrous ring is cut, or widely dilated, the same phenomenon takes place. The solution of the problem of strangulation of the intestine by the muscular or fibrous rings rests upon the study of this stage of the disease; for, at a more advanced stage, the orifice of the sac itself acquires an organisation which sufficiently explains all the phenomena of which it is the focus.

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[*] *Recherches anatomiques sur les Hernies de l'Abdomen*, 4to, Paris, 1817; and *Recherches sur les Causes et l'Anatomie des Hernies abdominales*, 4to, Paris, 1819.

[†] *Recherches sur l'Évolution du Sac herniaire*, &c. 8vo, Paris, 1842.

The second period, that of organisation. We may now examine the series of phenomena which take place in the neck and orifice of a perfectly-formed hernial sac. In the first period, the puckering only exists in such a condition as to be preserved by a ring, but, at a more advanced period, the different peritoneal folds form adhesions together, in consequence of the prolonged contact of their serous surfaces, and then the mouth or orifice of the sac exists independently of other structures; it becomes a new organ, annexed to the peritonæum, and has no longer need of being supported by the ring in order to exist. From this moment the orifice has an evolution peculiar to itself; it becomes the seat of very remarkable phenomena, which may be observed at different periods, and which may now be explained.

The serous surface is not alone the seat of morbid action relating to the organisation of the orifice. In the subserous connective tissue changes of no less interest take place. The adipose tissue in this part diminishes, and even disappears, although the person be very fat. The connective and adipose tissues seem to be transformed into a new covering, which encloses a large quantity of blood-vessels. This rich vascularisation is often seen through the transparent peritonæum of the periphery of the herniary opening, converging from all parts towards the orifice, and afterwards radiating on the superior part of the sac, where it is insensibly lost by blending with the connective tissue.

M. Demeaux considers that the organisation of this annular induration begins in the sub-peritoneal connective tissue, and that at a certain time the peritonæum itself undergoes a change; it becomes vascular, and the two structures united together adhere closely. This induration of the internal surface of the orifice of old hernial sacs is due to an annular thickening of the peritonæum, nearly limited to the boundaries of the mouth of the sac, which is thus reduced to much less dimensions than any other part of it. Preparations demonstrating these conditions, with the exception of the vascularity, are preserved in the Museums of the Royal College of Surgeons and of the different hospitals of London.

A layer of fibres, which interlace in every direction and resemble the tissue of the dartos, is said to exist around the orifice of the sac. If these be contractile fibres, they must exert considerable influence to prevent the reduction of hernia, and may be considered as *one* impediment to that result. Are they not, probably, an excess of development of the contractile fibres of the connective tissue? M. Desprez considers them to be an exaggeration of the normal state. This dartos-like layer, having contractile properties, may also play its part in producing strangulation of some varieties of hernia.

The third period is one of contraction. Most writers on hernia have remarked the constant tendency which the orifice of the sac has to contract, and even to become obliterated, as soon as the herniated organs cease to act upon it.

This process is demonstrated in the cases of adhesion of the embouchure of the sac in infants; closure of its orifice in adults; and obliteration of the sac by persistence of omentum in its cavity. This termination, the most desirable of all, does not constantly occur. A gradual contraction may take place without the obliteration being complete; it is this disposition especially which gives rise to such formidable accidents.

At this period, if the orifice be examined anatomically, it is easy to prove that it has been the seat of a new transformation. In proportion as the tissues around the orifice become thicker and contract, their vascularity diminishes; and this layer, originally resembling the dartos, shows the firmness and resistance of fibrous tissue. In the second period, the orifice, susceptible perhaps of contracting spasmodically, may also permit of slight dilatation. In the third, all dilatation becomes impossible; either the margins of the orifice resist the pressure of the viscera, or the viscus which passes through the orifice becomes strangulated.

The tissues composing this annular contraction of the mouth of the sac often become nearly as hard as cartilage; and this change especially occurs in old cases, when the hernia has not been allowed to descend for a long time; for then the boundaries of the orifice are placed in the most favourable position for the process of contraction and induration to take place. But when the hernia is not reduced, the constant pressure of the viscera dilates the mouth of the sac as well as the fibrous rings.

Of the two kinds of hernial sac.—The 'hernial sac' is always a prolongation of the parietal peritonæum from the abdominal cavity into the neighbouring structures. Its development and formation, however, depend upon very opposite causes. Two kinds require to be described; the intrinsic and essential distinction between them depending upon their mode of development.

1. That kind which, being congenital, is merely a serous canal or sheath, the vaginal process of the peritonæum, until a hernia takes place and escapes into it, when it becomes converted into a hernial sac. The physiological designation for it would be THE CONGENITAL HERNIAL SAC.

2. That kind which is the result of a slow and gradual process of relaxation, and is produced by a stretching, yielding, or elongation of the parietal peritonæum, before and under the pressure of the viscus itself, which constitutes the hernia. For the sake of brevity, this kind may be termed THE ACQUIRED HERNIAL SAC.

The first kind, or congenital serous canal, which may becom converted into the congenital hernial sac, sometimes exist throughout life simply as a diverticulum of the peritonæum, an without a hernia entering it; but the second kind, the acquire hernial sac, cannot exist unless a viscus, almost entirel invested by peritonæum, pushes the parietal layer of tha membrane before it.

In other words, the first kind of sac is peculiar to a perso born with any portion of the vaginal process of the peritonæu open, and who then possesses a receptacle for the read irruption of a hernia; and, if the ventral orifice and cavity o this sheath should not become obliterated soon after birth, rupture may occur at any subsequent period of life; but the second kind being an acquired formation, some length of time is necessary for its production, and it cannot exist at all without the continued and effective influence of the hernia itself.

Pott, writing of the two varieties of oblique inguinal hernia, the congenital and ordinary, expresses his belief 'that common ruptures, or those in a common sac, are generally gradually formed, that is, they are first inguinal, and by degrees become scrotal; but the congenital are seldom if ever remembered by the patient to have been in the groin only.'*

The paramount importance of a due appreciation of the physiological differences between the one kind of hernial sac and the other will be demonstrated in many points of view, but especially with regard to the surgical treatment of hernia.

The treatment of reducible hernia.—The surgical treatment of all kinds of reducible abdominal hernia is divisible into two categories:

1. The employment of palliative or prophylactic measures.
2. The adoption of some proceeding designed to effect a permanent cure.

1. *Palliative measures.*—To this class belong all contrivances which prevent the descent of the hernia. These are the recumbent posture, bandages and trusses of various descriptions. If we only judge from the class of cases observed in the hospitals, and selected from among the labouring population, we should form a very inadequate estimate of the advantage which accrues to sufferers with hernia by the employment of well-adjusted trusses. We know of adult persons in comfortable circumstances who, having no need for toil, have taken precautionary measures to prevent the recurrence of the rupture, and have consequently been free from everything of the kind for several years after. Some have even been enabled to dispense with the use of the truss entirely, after wearing it some months. It is, however, a condition of the utmost practical importance that the case be treated immediately that the disposition to the formation of rupture is detected. When the hernia enters the vaginal process of the peritonæum, and that sheath is converted into the hernial sac, we may effect a cure

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* *The Chirurgical Works of P. Pott*, edit. 1808, vol. ii. p. 120.

by attempting to call forth the processes adopted by nature to close its orifice and obliterate that canal; or, in other words, to procure adhesions of the serous surfaces of this peritoneal diverticulum.

On the other hand, in the slowly-forming hernial sac the object in making use of a truss should be, in the first instance, to prevent the development of the peritoneal sac. This may be accomplished by applying support to those weak parts of the abdominal walls through which the parietal peritonæum is forced. When, however, the sac is once developed—and this is commonly the period at which a surgeon is consulted—measures should be immediately adopted to assist in arresting its dilatation by preventing the descent of the rupture.

The expediency of judiciously pursuing the mechanical treatment of every variety of hernia cannot be too strongly urged upon the laity by the profession. In both sexes it should be carefully conducted the moment that the slightest protrusion shows itself. Whether the hernia occur in infancy, youth, at middle age, or at later periods of life, if properly watched and judiciously supported, it usually gives but little trouble; in many cases it is even cured. But, on the contrary, if it be neglected, increase in bulk, and, sooner or later, diseased states of the rupture, often leading to the death of the individual, will almost infallibly occur.

The only exception to be made to this rule applies to thos rare cases of hernia into the vaginal process of the peritonæum in which the abnormal situation of the testis interposes practical difficulty to wearing a truss, the necessary pressure o which occasions intolerable pain by compressing that orga simultaneously. But even such cases should not be abandone as hopeless of cure, without a reasonable attempt being firs made to afford relief.

The practice of leaving cases of rupture in the hands of mer tradesmen cannot be too strongly censured. Among the poo we constantly observe the lamentable effects of this proceeding Ill-shaped trusses are applied; the springs, being too feeble allow the hernia to descend behind the pad, where it become compressed; or they are too strong, and their pressure induce absorption of the abdominal parietes, on which the pad presses Frequently a truss suitable for supporting a femoral hernia i applied to one of the inguinal kind, and *vice versâ.* That which is worth doing at all is always worth doing well. This in-junction receives strong confirmatory testimony in the treatment of ruptures by mechanical means.

Characteristics of trusses.—The requisite and essential qualities of a truss are lightness, firmness, elasticity, so that it shall retain the required form or shape, suitable adaptation to the configuration of the wearer, and sufficient strength of spring to prevent the escape of the rupture from the abdomen.

The instrument consists of a pad or cushion attached to a metallic spring, with straps, so arranged that its movement during the varied postures of the body may be restrained.

Through the kindness of Mr. J. A. Kingdon, Surgeon to the City of London Truss Society, we are enabled to give the results of his extensive experience in the employment of trusses.

He considers that the circular spring truss is the most suitable form, in the majority of cases. Bandages which are not elastic do not afford sufficient support to the hernia in every posture of the body. They are necessarily unsafe on this account, as they become lax in the stooping posture of the wearer—the position of all others in which the hernia most easily descends, because of the relaxation of the pillars of the external ring. The curve of the spring and the relative position of the pad with it should be appropriate to the configuration of the wearer. A single piece of metal should form the spring and foundation of the pad. As far as practicable, the spring of the truss should pass around the bony rim of the pelvis, fitting closely to the figure, and should lie out of the region of the glutæi muscles. For, unless it be so placed, their alternate action in progression produces a corresponding movement of the pad. If these muscles be largely developed, extending upwards to the very edge of the pelvis, the curve of the spring should be wide at the shoulder, so that its bearing or resting part may be on the base of the sacrum.

For a single pad truss the free end of the metal spring should be beaten out flat and thin, and so ground as to cling around the opposite hip,—an arrangement which materially aids in steadying the truss.

The form of the spring may be designated as after the French model or the German. The former resembles the coil of a watch-spring, and is very elastic and clinging; the latter almost exactly fits the outline of the body in its state of repose.

It is almost inelastic, and very hard. The French is always pressing inwards, even when the wearer is at rest. The German scarcely presses at all when the abdomen is soft, but resists with power when any expulsive force makes the abdomen swell. In practice, the best shape for the spring is one which forms a medium between these two extremes.

The pad or cushion should be of moderate dimensions. For the adult, it should not exceed two and a half inches in length, and two inches at the widest part. Its superior edge should follow the upper line of the spring, which falls a little from the shoulder or bend, where it lies in contact with the hip. The inner surface should be directed slightly upwards, but this inclination must depend upon the prominence, or otherwise, of the abdomen, as well as, in some measure, on the anatomical relations of the pelvis to the spine. The proper shape for the cushion or pad, and the materials of which it should be constructed, may be varied to accommodate particular cases, or to accord with the views of different inventors. Generally, the wearer discovers, after a little experience, which kind of pad is most free from annoyance. That pad, however, is the best which maintains perfect and unintermitting retention of the hernia. Every pad should have attached to it two studs, one near its junction with the spring, and another at its lowest point. To the upper one the transverse strap passing from the free end of the spring is attached. The lower stud is used with the thigh-strap, which should be always worn. It is loosely fastened on to the spring of the truss near its shoulder, and should fall along the hollow beneath the buttock. In the erect posture of the wearer this strap should be moderately tight. It prevents the pad from shifting from its proper position, and should never be discarded.

These appear to be the general principles by which a surgeon is to be guided in the selection of a truss. Particular modifications suitable for special kinds of hernia will be noticed in other places.

Of the so-called radical cure of a hernia.—It would be idle to encroach upon the limits of this essay by describing in detail every method employed to effect a cure of hernia, from the most remote periods. A mere notice of them will suffice. They were —castration; cauterisation of the orifice and neck of the sac; ligature applied around the neck of the sac; incision of the sac, and subsequent healing of the wound by granulation; excision, suture, and scarification of the sac; detaching the sac from its connections and returning it into the abdomen; immediate and forcible compression of the sac by a bandage or truss; cold douche; stimulating injections, especially tincture of iodine. Such proceedings have been long abandoned, in consequence of the fatal results which frequently attended their employment.

We must, however, add the treatment recently adopted, namely, invagination of the hernial sac. Every modification of this operation is usually designated by the name of the inventor: thus there is the method of Gerdy, of Wutzer, of Rothmund, and others.*

The principle of this operation is expressed by the words, 'invagination of the hernial sac.' That is to say, the fundus of the sac is pushed up into its mouth, and retained there until adhesions have formed between it and the entire circumference of the orifice. By this means it is hoped that obliteration of the ventral orifice of the sac and of its cavity may become permanently established. It is an indisputable fact, that cases of reducible inguinal hernia have been permanently cured by the performance of an operation on the plan of Wutzer. We have not, however, the data by which to establish the proportion of cures to failures; but that a considerable number of the cases operated upon did fail, is certain.

Mr. Kingdon has very kindly given me the notes of sixteen cases in which an operation for the radical cure of the rupture had been performed, either by London, provincial, or colonial surgeons. The patients applied to him for relief at the City of London Truss Society. In most of these persons, at the time they ceased to be under the observation of the operator, the rupture was 'cured;' for reports of some of the cases appear in the medical periodicals of the day. In some of these patients the rupture was larger than before the operation, and greater difficulty was experienced in retaining it within the abdomen. In others, a protrusion existed on both sides, the second having become developed after the operation.

Through the intervention of Dr. Hermann Weber, Physician to the German Hospital, I have received a valuable communication from Dr. Otto Weber of Bonn, who was formerly clinical assistant to Professor Wutzer. The number of persons upon whom the Professor operated amounts to about fourteen. Between 1852 and 1856 the operation was performed but once in the 'Klinik,' during which time Dr. Otto Weber was clinical assistant to Wutzer. The patient was a teacher, forty years old. He quitted the hospital 'cured,' but the hernia returned in spite of his having worn a truss.

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* The most complete account, especially of the German cases, is to be found in Günther, *Lehre von den blutigen Operationen*, Lieferung 50.

Wutzer is still of opinion—1. That when the operation is properly performed after his method, it is not attended with danger. 2. That he has succeeded in fixing the plug of skin with invagination of the hernial sac by inducing adhesions between its internal surface and the interior of its neck. 3. That in consequence of this, if the patient continues to wear a truss (for life), a return of the hernia may be avoided.

However, Dr. O. Weber writes, that he has never seen any of the so-called 'cured cases' radically cured, but that—First, the plug of skin is, by degrees, entirely drawn out again. Secondly, that the true herniary apertures, the external and internal rings, are not closed by the operation; and, thirdly, that an imperfect cure may be effected by means of a partial closure, by adhesion of the internal walls of the neck of the hernial sac, and thickening of the surrounding connective tissue.

The cases which Dr. O. Weber had an opportunity of examining some time after the operation, showed a slight protrusion of the intestine into the inguinal canal; and there would have been a perfect return of the hernia if trusses had not been worn. It appears that, at first, the invaginated skin becomes adherent to the inguinal canal, but without the participation of the hernial sac; that the latter probably becomes merely compressed by the invaginated skin passing by its side. In the most favourable cases the inner walls of the hernial sac may adhere together, but so loosely that they soon become separated by pressure.

The results of the examination of the bodies of persons after death upon whom the operation had been performed, are very important. Streubel has published some. Dr. O. Weber examined the body of a man who died of pneumonia in 1856, and upon whom Wutzer operated in 1840. The hernia had returned after the operation. There was not a trace of the invaginated skin in the inguinal canal, and the peritonæum did not show any signs of previous inflammation. The hernia and its sac did not differ from the ordinary cases of the same kind.

Dr. O. Weber thinks that Wutzer's method might be perhaps modified in such a manner as to become effective. But, first, he considers it is necessary to show upon the dead body that the fundus of the hernial sac can be actually invaginated into its orifice, and not merely pushed up a certain distance before the integuments.

But, instead of describing in detail the operation of Wutzer and its modifications,* let us inquire, what is the object the surgeon has in contemplation when proposing to perform an operation for the radical cure of a hernia? In order to be effectual and permanent, it must, of course, produce the obliteration of the hernial sac; the closure of its ventral orifice; the strengthening of those weak parts in the walls of the abdomen through which the rupture protrudes; and to these conditions must be also added, an improved tone of the peritoneal ligaments of the viscera, by which the power they exert in retaining the viscera in their normal situation is restored. Unless the operation perfectly and completely accomplishes these ends, failure must most certainly ensue sooner or later.

Another intention which the successful issue of the operation is expected to fulfil, is to enable the sufferer to dispense with the use of a truss, and thus to be free from an intolerable incumbrance. To recommend a dangerous operation, therefore, which may prove only so far successful as to impede the descent of a hernia, but yet leaves the patient under the necessity of continuing to wear a truss to prevent a recurrence of the rupture, is surely scarcely justifiable. It is contended by the advocates for the operation that the dangers to which the patient is subjected have been too prominently set forth. This may be true. Few persons have indeed died from peritonitis, or other causes, in proportion to the numbers upon whom the operation has been performed. But they all were subjected to that risk, and because they happily escaped the fatal complication, that is no ground for the inference that others would do so also. The facts only show that the operation may be done without exciting peritonitis in every case.

The surgeon, in the attempt to carry out his object, proposes to produce an effect in imitation of the processes of nature during the early periods of life; for there are facts to demonstrate that the cavity of the vaginal process of the peritonæum, which is, in so many cases, an apt receptacle for any protruded viscus, may become obliterated even after a hernia has passed into it in early infancy. But where is the evidence to prove that an acquired hernial sac becomes thus obliterated by similar natural efforts? The only instances, perhaps, are those in which the orifice of the sac is plugged by adherent omentum; and such cases are very rare.

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* Operations intended to effect the radical cure will be described with the treatment of the special kinds of hernia.

We therefore believe that we shall not err in enunciating the principle that the cases of inguinal hernia selected for the performance of all operations for the radical cure should be those in which the protruded viscus has descended into a patent vaginal process of the peritonæum, and that all other kinds should be rejected as unsuitable; and that the more efficiently the proposed methods accomplish the ends effected by the processes of nature, the more worthy of confidence they become. Thus, allowing nature to guide our procedure, we must make it a rule to select those cases in which her efforts have failed; and by acting as her handmaid, we may reasonably hope to arrive at a successful result.

We may conclude these observations with the following quotation from the work of Mr. Lawrence: 'The subject of an incarcerated rupture submits to an operation in order to save his life. But he whose hernia is reducible, endangers his life to get rid of an inconvenience; and the operation affords no greater prospect of entire recovery than he had without it. For after he has undergone an operation, at the hazard of life, the complaint may return; and the only protection against relapse is to wear a truss' (*Treatise on Ruptures*, chap. vi.).

The morbid conditions of the hernia, and impediments to its reduction.—A hernia is said to be reducible when the protruded viscera can be returned into the abdominal cavity; it is irreducible when they cannot.

The impediments to the reduction of a hernia may be classed in three groups: those produced by the tissues outside the sac; those occasioned by the sac itself; and those which exist within the sac.

There are also primary or immediate causes which render a hernia irreducible, as well as secondary. Among the first we may include all those impediments to reduction which depend upon organic conditions, and relate directly to the hernial sac;

as, the muscular contraction which influences the size of the abdominal rings and the tension of the tissues around the orifice of the sac; the condition of the orifice of the sac itself; and the development within the sac of adhesions or omental sacs.

The secondary are those which are partly exclusive of the hernial tumour, and occur, as it were, accidentally, and are merely due to individual peculiarities; as, for example, the development of a thick layer of fat around the hernial tumour; its great mobility; its diminutiveness; tension of the sac from accumulation of the fluid or gaseous contents of the bowel; adherent omentum lying in front of the intestine; and some other conditions.

The morbid conditions of the hernia which give rise to more or less serious difficulties may be classed under one of the following states: 1. Permanent irreducibility. 2. Distension or inflation by fluid, gaseous, or solid contents, termed obstruction. 3. Inflammation. 4. Strangulation.

1. A hernia becomes permanently irreducible, after many years' existence, on account of its size. In most cases this condition is only attributable to neglect of the use of a truss. The largest double rupture I have seen was in a bricklayer, fifty-five years old, whose bodily health, strength, and conformation were in other respects very good. The left hernial tumour was the larger, although it had only existed about three years, whilst the right had been there twelve. The lowest border of the tumour very nearly reached to a level with the patellæ. Its circumference in the largest part measured thirty inches.

Adhesions also, when formed between the contents of the sac, or between the sac and its contents, prevent the reduction of the protrusion.

2. Distension; choking; obstruction; rendering the hernia irreducible. This particular state or condition of a hernia is attributed to the accumulation of the solid, fluid, or gaseous contents of the alimentary canal within that portion of the bowel which constitutes the protrusion. From this cause the passage of the stercoraceous contents of the canal are arrested; the alimentary canal or tube becomes choked up with its own secretions and the egesta of the stomach, giving rise to local troubles and constitutional disturbance.

The doctrine of obstruction is of great antiquity, and for a long period that morbid condition of a hernia we now term 'strangulation' was believed to originate in this cause alone. 'During nineteen centuries,' writes M. Broca, 'the existence of an accumulation of fæcal matter in the hernia had been admitted, or rather supposed: but when it was looked for, the accumulation was not to be found. Thus theory fell to the ground on the first observation.'

The local symptoms of an obstructed hernia are—pain, a flatulent state of the tumour, increase of size in comparison with its usual dimensions, more or less tension, and the absence of those more severe local conditions which characterise a strangulated bowel. By careful manipulation, the gaseous and fluid contents of an enterocele may be expressed into the contiguous part of the canal, and even solid fæcal matter may be felt. During this proceeding the gurgling produced by the flatus and fluid is heard, and the movement of these is sometimes felt as they escape through that portion of the bowel lying within the orifice of the sac.

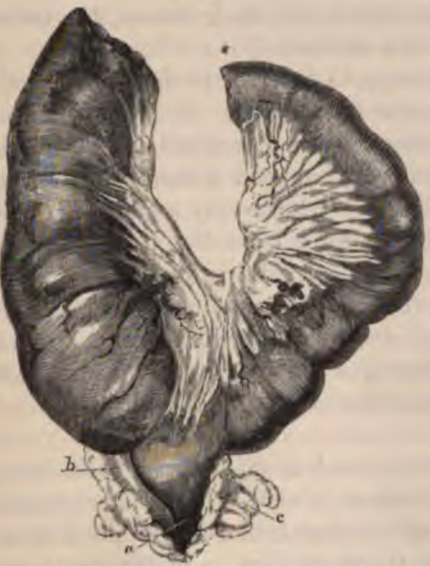
At first, the constitutional symptoms indicate functional disturbance of the alimentary canal, rather than any morbid state of the tissues of the herniated viscus. There are indications merely of a blocking-up of the tube, and nothing more. Thus, slight pyrexia and nausea, succeeded by vomiting, are the most marked features, which continue even although the large intestine below that portion in the sac has been emptied of its contents after the commencement of the attack. Unless the vomiting be very prolonged, and great depression result therefrom, as occasionally happens in very delicate or old persons, the surgeon will not fail to remark the absence of the urgent symptoms characteristic of strangulated bowel.

In most cases of obstruction the impediment is removed by those means which excite the natural peristaltic movements of the alimentary tube. The local application of warmth and moisture to allay pain; repose; the administration of aperient enemata, or even in some cases, when vomiting has not occurred, of purgatives, by the mouth, are beneficial. Abstaining, in the first instance, from manipulation of the tumour, is a point of great importance. Should the impediment to the passage of the indurated fæcal matter depend upon the contraction of the orifice of the sac, the enlargement of this part becomes necessary, either by cutting its tissues or those around it. The operation must then be performed in the usual manner, and in relation to the special case.

3. *Inflammation of a hernia.*—A hernia in this state shows all the local signs, and excites the constitutional symptoms of inflammation. The combination of those indications which characterise the condition called strangulation do not, however, exist.

Inflammation is usually the result of external violence, and may be produced by the pressure of badly-fitting trusses. A morbid state of the whole alimentary canal, of an inflammatory type, may extend to the hernia, and in that way give rise to local trouble.

Fig. 264.



Hernia at the femoral ring of a part only of the walls of the bowel. The patient, fifty-six years old, had been ill nine days, when the exploration of a small swelling in the site of the left femoral ring was made. She was then dying, but survived the operation forty-five hours. After death peritonitis was found, and the intestines in the pelvis were united together. * The cæcal end of the bowel, the tube contracted between it and the hernia adherent to the sac. *a.* Intestine adherent to the sac. *b.* Peritoneal sac. *c.* Lobules of fat outside the peritoneal sac. (Museum Guy's Hospital, Drawing 484^{20}—Preparation 2503^{20}.)

Irreducible epiploceles are more liable to be inflamed than other kinds of hernia; and a patient the subject of reducible epiplocele may have the hernia inflamed, from which cause it becomes permanently irreducible by contracting adhesions to the sac.

The local signs are—pain, increase in the bulk of the tumour, a certain degree of hardness, firmness, and elasticity when it is pressed, with more or less unevenness and irregularity of surface. The margins of the aperture through which the hernia passes do not tightly embrace the protrusion, so that, in a large hernia, the finger can be passed along the pedicle of the tumour for some distance.

The constitutional symptoms are not usually severe. In the first stages more or less pyrexia arises; and when the contents of the tube are arrested in their course, the indications of that condition become marked.

It is unnecessary to describe in detail the local and constitutional measures to be adopted. Reliance must be placed upon those in ordinary use to control and arrest the disease.

There occasionally happens a variety of hernia, first noticed by M. de Littre,* in which only a portion of the wall of the ileum, or a diverticulum from the bowel becomes adherent to a very small hernial sac. By extension of inflammation to the neighbouring viscera, obstruction to the passage of the stercoraceous contents of the tube arises, and death ensues.

Fig. 264 illustrates this variety. It was drawn from a case which was under the care of the writer.

4. *Strangulation.*—A hernia is said to be strangulated when the displaced viscus is subjected to a constriction which impedes or arrests the circulation of the blood through its vessels, the passage of the stercoraceous materials along its canal, and constitutes an impediment to its return into the abdominal cavity. This condition excites constitutional symptoms of a most dangerous and characteristic nature.

Is the condition of a hernia, termed strangulation, solely the result of mechanical constriction produced by the margins of the orifice of the sac; or does it depend upon a morbid action engendered in the tissues of the protruded bowel antecedent to its escape from the abdominial cavity? In several instances of strangulated femoral hernia in women, and in some cases o inguinal hernia in men, the patients themselves voluntaril stated that, for some hours before the hernia caused any inconvenience, or was even in the sac, their bowels had been 'disordered,' 'relaxed,' or that they had been suffering with 'bowel-complaint.' In other cases, there seemed to be a great tendency to a very rapid derangement of the mucous membrane along the whole track of the canal above the hernia, scarcely explicable upon the supposition that it had been all excited by the mere existence of a constriction around a small knuckle of intestine. As evidence of this morbid action, I would adduce the fact of the rapid and abundant secretion from the entire mucous surface of the small intestines, their great distension and intense vascular congestion, witnessed in some instances.

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* 'Obs. sur une nouvelle espèce de Hernie,' *Mém. de l'Acad. royale d Sciences*, 1700, p. 300.

Again, given any case of reducible hernia, which for months, or even years, has readily glided into the hernial sac, and has been returned as easily into the abdominal cavity, why on some particular occasion should it become irreducible when it has passed through the same orifice it has been in the habit of traversing, and in the tissues of which no appreciable changes have occurred? For it is in vain we seek any marked alteration in the structures around or composing the orifice of the hernial sac itself.

In giving an affirmative reply to the above inquiry, we are justified by facts in attributing the strangulated state of a hernia to a predisposing cause, commencing in a morbid state of the alimentary canal generally; at least, in some cases. Patients often relate how they had observed that the hernial tumour was 'larger than usual' before they suffered much inconvenience; and this circumstance is commonly attributed by them to a greater bulk of the protruding viscus. But we have no proof that this is the correct explanation of the increase of size of the tumour in all cases; in some doubtless it may be. It is due to a distended state of the bowel rather than to quantity.

Let us examine a case of reducible inguino-scrotal enterocele. At one moment all that the surgeon can detect is a slight fulness produced by an empty hernial sac. At another, a small knuckle of intestine, having descended in an empty condition, becomes more or less filled with the stercoraceous contents of the alimentary canal from above it, and an elastic swelling results, which is produced by the bowel and its contents, fluid and gaseous. Assisted by the peristaltic movement of the viscus itself, or by gentle pressure, these contents of the tube are conveyed along the proper channel, and the hernia, that is, the bowel, is emptied, and it readily resumes its normal position in the abdominal cavity. Observe, now, that the tissues of the bowel have undergone no change. But let the distension continue, and the first indications of mischief are local pain and an enlargement of the swelling; next, a sensation of uneasiness in the hypogastrium, of dragging from the rupture upwards, still greater increase in the magnitude of the tumour, and great pain when handling it, take place. Do we not recognise in these phenomena the peristaltic action of the canal, the swelling of the tissues of the hernia by congestion of its vessels and irritation of its nerves? During these progressive stages the protrusion has attained a size dependent upon more than one cause. Distension, caused by accumulation of its contents, and swelling of its tissues, induced by the effusion of inflammatory products, reacting against the narrow orifice of the sac, produce more or less retardation or arrestation of the sanguineous current in the blood-vessels of the rupture, and its strangulation is the result. The increased bulk of the protrusion prevents its retrograde passage through the small aperture by which it escaped from the abdomen. The body of the sac being also stretched, may mechanically contract the dimensions of its orifice in some measure; whilst the arrangement of the whole tumour, in relation to the mouth of the sac, may likewise afford an impediment to its reduction.

The filaments of the nerves of the injured bowel play an important part in transmitting thence to the nervous centres the local disturbance of their sentient extremities, and constitutional sympathies are excited. The heart contracts more frequently, and with greater force; the pulse is full, and more frequent than normal; the cheeks are flushed; the surface of the body is warmer than usual, often moist, though sometimes dry; the tongue is covered with a white fur; nausea and intolerance of food are complained of; tenesmus occurs, and flatus or a small quantity of fæces may be expelled, if the large intestines chance to contain any.

Uncontrollable retching and vomiting become the next established features of the disease; prostration of the bodily powers rapidly supervenes, and death may take place at this stage from collapse alone.

Enlarging upon this brief sketch of the symptoms which indicate the commencement and progress of strangulation of intestine, we must now systematically describe—

First, the condition of the hernia when strangulated.

Secondly, the changes taking place in the tumour.

Thirdly, the constitutional symptoms excited by the local disease; and,

Fourthly, the morbid conditions developed within the abdominal cavity.

The structural changes taking place in the hernia.—When the bowel is in the condition implied by the word 'strangulation,' the circulation of the blood within the vessels of the part is, at first, impeded. Congestion of the capillary vessels is the consequence, and the tissues of the viscus become swollen. When exposed to view, in this first stage, the serous membrane is of a deep-red tint, and through a lens the minute blood-vessels may be distinctly seen, with their outlines well defined. To the touch the hernia feels firm, and resists slight pressure; but the elasticity and resiliency of its tissues still continue unimpaired.

Next, the circulation of the blood is arrested. The tissues of the bowel, about which the constriction is tight, become now more swollen; they have palpably a solid, leathery consistence; the colour of the serous surface is a dark purple; it is dull, lacks its usual lustre, and sometimes, varying as regards shade or depth of colour, it is mottled with a red and purple tint. Patches of extravasated blood appear in the subserous connective tissue, and an adhesiveness to the fingers is very striking.

When the bowel has been strangulated many hours, its tissues are more swollen and soft; they no longer possess their characteristic elasticity, but they remain in the same position in which the pressure of the finger places them. The serous surface has lost all its characteristics; it is black, ash-coloured, flocculent, and adhesive. In this stage all the tissues of the bowel have undergone more or less disorganisation; blood is extravasated in the connective tissues between the different coats of the viscus; the mucous membrane is soft, flocculent, and easily detached from the fibrous walls. Probably in some part of the bowel, at its convexity, or where it is in immediate relation with the mouth of the sac, its tissues have sloughed, or ulceration is concealed by shreds or patches of adherent lymph.

The intestine is also usually firmly fixed to the mouth of the sac by inflammatory adhesions.

The last stage is that in which the entire mass of the protruding bowel has become gangrenous, or has passed into a condition termed sphacelus.

In the diseased conditions just described we may recognise morbid changes similar to those which are observed in structures on the outside of the body. If a string be tied around the penis near the prepuce, the latter organ becomes first swollen, secondly, inflamed; thirdly, it suppurates; and lastly, it mortifies. Ulceration also takes place at the part with which the ligature is in contact.

The coats of the bowel are often ulcerated by the pressure of the constriction to which they are subjected, but the various tissues of which the viscus is composed are endowed with different powers of resistance to those morbid processes. Thus it may be seen, on cutting open the intestine, in cases in which the bowel has been deeply sulcated or grooved on its serous surface, without any trace of abrasion thereon, that the mucous membrane is ulcerated in a line corresponding to the part immediately embraced by the medium of constriction. Occasionally it happens that the line of ulceration forms only at that end of the strangulated bowel directly continuous with the upper and distended portion of the alimentary tube, whilst there is none at the other end. This is probably caused by the pressure of the distended bowel within the abdomen, and it may be seen, particularly in some cases where the knuckle of intestine lies in close relation with Gimbernat's ligament. We have even observed blood in the fæcal evacuations of patients who have died with the bowel thus diseased.

Mr. Bryant states * that ulceration at the line of stricture is most frequent in inguinal hernia, although the sulcated condition of the bowel is as common in femoral as in inguinal; and that fæcal extravasation, if not produced by ruptured bowel from taxis, generally follows ulceration at the line of stricture.

Small, recently-developed herniæ are more frequently strangulated than large ones, and those which have existed some time. Sir A. Cooper writes: 'A small hernia is more easily strangulated than a large one, the pressure on the contents being more

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* *Guy's Hospital Reports*, 1856.

violent, and the symptoms are much more urgent, as the stricture acts with much more effect upon a single knuckle in stopping its circulation, than when the contents of a hernia are large and voluminous.'[*]

It is a matter of great importance to distinguish between the two classes of hernia—'RECENT' and 'OLD.' Mr. Pott observes: 'Recent hernias are in general more liable to stricture than old ones, for reasons which are obvious from what has already been said; but when old ones get into the same circumstances, the symptoms are much the same; though I think in general they are not altogether so pressing, and the latter generally admit of more time to attempt reduction in.'[†]

And very lately Mr. Bryant has demonstrated, by the cases admitted into Guy's Hospital, that in recent hernia strangulation frequently occurs, and that the risk attending it is very great, even although the bowel be speedily liberated.[‡]

Morbid states of the hernia induced by violent manual pressure.—Let it not, however, be assumed, that the morbid states of a hernia, above described, are always inevitably due to the compression which the orifice of the sac has exerted around it. Such is not the fact. The tissues of the herniated viscus are rarely so firmly constricted as to produce in a short space of time complete mortification, absolute death, of the whole of the knuckle of bowel in the sac; yet this state of the hernia is often met with. In these cases the protruded viscus has been subject to another source of damage and destruction. Under the mild expression of 'the use of the taxis,' the hernia has been forcibly compressed by manipulation; its tissues have been contused and irreparably damaged; blood has been extravasated in profusion between the different layers of the tissues composing the viscus, and complete disorganisation of its structures is the result of the injury inflicted. I have been for many years interested in ascertaining, from the observation of the state of the bowel after death, the comparative amount of injury inflicted on the viscus by the natural constriction of the orifice of the sac, with the tissues around it, and that produced by violent manipulation of the tumour, with the hope of reducing the hernia. I am constrained to state that the damage produced by the first cause is in no degree commensurate with that which results from the last; and that in all the instances in which the entire bulk of the herniated bowel was in a state of sphacelus, that condition was the result of violent, protracted, and ill-applied manipulation. The progress of these morbid processes is likewise accelerated by the same means; for it does not often happen that mortification of the whole piece of the bowel is observed in those cases in which the nature of the disorder happens not to have been recognised very early, and when the manipulation of the tumour has not been employed.

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[*] *The Anatomy and Surgical Treatment of Abdominal Hernia*, part i. chap vii., the last paragraph.

[†] *The Chirurgical Works of P. Pott*, edit. 1808, vol. ii. p. 63.

[‡] *Guy's Hospital Reports*, 1861.

I may represent the danger which is associated with violent attempts to reduce the hernia, by stating, in a few words, that more irreparable damage may be inflicted on the bowel in a few minutes by coarse, careless, impetuous brute force, than the natural means of constriction could produce in several days.

Need I add, that in the attempts to reduce a strangulated hernia, the employment of such violence as must be necessary to produce these results is reprehensible in the extreme, and is justly condemned as not only opposed to every sense of humanity, but because it is in violation of all the principles of practical surgery?

Artificial anus.—Two conditions of the intestine lead to the formation of an artificial anus. One, in which a portion only of the wall of the intestine sloughs, leaving a small ulcerated opening as if a piece had been punched out, which does not interfere with the continuity of the alimentary canal, although it allows a portion of its contents to escape. This opening commonly forms at about the centre of the convex free border of the knuckle of intestine, and at a point farthest removed from the orifice of the sac.

Another variety is due to ulceration of all the coats of the bowel, even to the mesentery. It usually occurs in the part of intestine at the mouth of the sac; and, in consequence, the continuity of the canal is destroyed, and all the stercoraceous matter escapes through the opening.

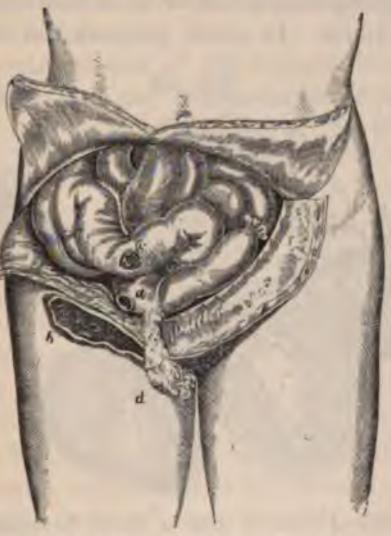
Figs. 265, 266 show the appearances before described.

Intermediate between these two extremes we meet with varieties in which more or less of the walls of the tube is destroyed, producing corresponding results. I may state that, after the first accident, repair of the hole frequently takes place, the wound of the integuments heals perfectly, and complete recovery ensues.

After the second, however, the prognosis is not so favourable; for, commonly, an artificial anus is permanently established, and more or less of the contents of the alimentary tube are discharged thereat.

As the result of long-continued constriction by the mouth of the sac, and the pressure made upon the two pieces of intestine lying therein, their walls become adherent at the points of contact, ulceration takes place, and the continuity of the tube is thus established within the abdomen, by the processes of nature alone. This condition is very rarely met with, and I may therefore refer the reader to a published case.*

FIG. 265.



Artificial anus after strangulated ileum, at the convexity of the tube. The patient, seventy-two years old, was the subject of strangulated femoral hernia for 'two days,' but probably more, when the protrusion was returned by operation. The bowels acted freely by the anus, but on the fifth day from the operation fæcal matter was discharged from the wound (*b*). Fæces continued to pass through it until death, which took place seventeen days after the operation. The perforated bowel was the ileum, about a foot from the cæcum, which is seen in the wood-cut (*a*). It is raised from the mouth of the femoral aperture to show it more distinctly. Fæcal extravasation into the peritoneal cavity was prevented by adhesions between the margins of the perforation, neighbouring coils of bowel and omentum (*c*, *d*). The patches or marks on the coil above and behind are the remains of those adhesions. (Drawings, Museum Guy's Hospital, 486^{3}.)

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* *Transactions of the Pathological Society*, vol. x. p. 128; the preparation is preserved in the Museum at Guy's Hospital, No. 2492^{10}.

producing bubbles, is an indication that the herniated bowel is probably ruptured, and that a communication exists with the interior of the alimentary tube.

If the progress of the disease be not arrested by the liberation of the bowel, its tissues mortify, the coverings of the sac become inflamed, infiltrated with serum, and at last with pus. Crepitation may be felt, which arises either from the development of gases in the decomposing tissues, or depends upon their escape from the alimentary tube; and finally gangrene of the skin ensues, and through the opening caused by the separation of the slough the contents of the intestinal tube escape, and an artificial anus is established.*

In cases of entero-epiplocele, after the reduction of the intestine by the taxis, the irreducible omentum sometimes becomes inflamed, and, together with the sac and its coverings, suppurates, sloughs, and becomes detached in the usual manner; the patient subsequently making a good recovery.

Constitutional symptoms induced by the morbid state of the alimentary canal above the hernia.—Many of the general or constitutional symptoms of strangulated hernia are excited by the morbid condition of the part of the alimentary canal above the portion herniated, more than by the state of the hernia itself. The simple obstruction to the passage of the stercoraceous contents of the tube induces severe constitutional disturbance; an illustration of which is afforded by cases where the canal is crossed by fibrous bands, or directly compressed from any other local cause.

There are so many functions disturbed by the retention of the hernia in the sac, that it is very difficult to assign the constitutional symptoms to any single circumstance, such as the constriction of the hernia. Yet it is almost impossible to deny that some very marked influence arises from this single cause alone; for what change is more marked or striking than the cessation of vomiting immediately ensuing upon the liberation of the bowel? The hernia is indisputably the primary and exciting cause; but much of the constitutional disturbance must be referred to those morbid phenomena which progressively arise as the result of mere obstruction of the alimentary canal.

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* John Hunter writes: 'It is very curious to observe in hernias, that while the gut is in the sac and alive, no inflammation takes place on the sac or integuments; but the moment the gut becomes mortified or dead, the stimulus of an extraneous body takes place immediately; an outlet is then endeavouring to be made by the inflammation and suppuration of the sac forming an abscess in it; which matter, with the contents of the gut, is brought to the skin. While this is going on, the sound gut within the abdomen, where it passes into the rings, adheres to those rings all round; so that when the abscess is formed, burst, or opened, and the mortified parts sloughed off, these ends of the gut open into the abscess, and not into the cavity of the belly.'—*Hunterian Ms. Descrip. Cat. of the Path. Specimens in the Mus. Roy. Coll. of Surgeons of England*, vol. iii. p. 117.

We may consider these effects of obstruction under two heads. First, those produced in the portion of the viscera within the abdomen; secondly, those excited in the nervous, respiratory, and vascular systems.

Effects of obstruction.—That part of the alimentary canal which is between the stomach and the hernia becomes by degrees distended with flatus and fluid of a dark-brown colour. The mucous membrane is deeply injected, sometimes of the colour of blood. The serous membrane is also red, from vascular turgescence; and often patches of a deep-red tint produce mottling of its surface. After long protracted distension, the contractile tissues of the small intestine seem to lose their function, which in some cases they never regain. When obstruction occurs to a part of the colon, the patient may die from perforation of the coats of that bowel, or even of the cæcum. The portion between the hernia and the anus, whether small intestine or large, is contracted; the mucous and serous membranes are generally pale. The bowel often contains a little tenacious mucus.

Results of peritonitis are seen after death in the form of shreds of plastic lymph adherent to and lying between the coils of the bowels; or a large quantity of sero-purulent effusion occupies the peritoneal cavity.

Constitutional symptoms of strangulated intestine.—The constitutional symptoms, which are regarded as indicative of strangulated intestine, when associated with a local tumour in any site of a hernia, become marked and highly characteristic after vomiting has once commenced.

That train of symptoms seems to be mainly due, first, to nervous irritation starting from the herniated viscus, and afterwards to the interruption of the passage of the stercoraceous matter; for any circumstance producing mechanical obstruction causes very similar results. Thus, if any part of the aliattributable to the extreme prostration of the nervous system, induced by protracted vomiting; for in after-death examination of such cases we do not discover any organic lesion to cause it.*

The next stage, characterised by distinct symptoms, is after the development of peritonitis. But this does not always occur over so large an extent of surface as to excite grave apprehensions for the result. Peritonitis is often purely local, and confined to a small area around the region in which the hernia is situated. Perhaps the local inflammation is only just sufficient to produce adhesions between the orifice of the sac and the protruded intestine. However, when general peritonitis is developed, the usual symptoms of the disease are well marked. Hiccough is especially regarded as an unfavourable indication. Peritonitis, in the most severe form, arises when the walls of the bowel have been perforated by ulceration, thus allowing their contents to escape into the peritoneal cavity. Intense abdominal pain immediately follows this accident, collapse supervenes, and death speedily releases the sufferer.

The last stage is collapse: a condition in which the vital powers scarcely seem to exist any longer; the sufferer, although not physically dead, yet seems to linger on the threshold of that state. The patient may continue some hours pulseless; the extremities cold, and the breath also; the facial aspect deathlike; the power of speech but slightly impaired; until a sudden change comes over the features, and life has departed.

We have before described the pain felt in the hernial tumour. Besides this there is a peculiar sensation of tightness or constriction referred to the umbilicus. This is a highly characteristic feature of a strangulated hernia. The patient describes the suffering as resembling the effect which would be produced by encircling the mesogastrium with a tightly drawn cord. To this is sometimes added a dragging sensation, extending from the epigastrium to the hypogastric region.

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* Mr. Obré showed a dissection of a case of entero-epiplocele illustrating this fact, at the Pathological Society (*Path. Trans.* vol. vii. p. 219). A woman, fifty-three years old, died after four days' strangulated bowel, without receiving medical advice. After death a small portion of intestine was found perfectly strangulated in the left femoral ring; it was intensely blue, but its tissues unaltered. The small intestines were preternaturally red, but not inflamed.

M. Malgaigne also reports a case of the same kind. Strangulation of the intestine had existed eight days, when the woman died. There was neither gangrene, ulceration, nor peritonitis. He then observes that we see that a strangulated hernia excites such an extreme depression of the vital powers that patients may succumb without any anatomical lesions appearing to produce that event.—*L'Union méd.* 1854, p. 248.

Pain, regarded as a symptom of peritonitis, is an uncertain indication. This disease frequently exists without much pain being experienced, and even pressure on the abdomen is endurable without causing complaint. Pain is more particularly absent in those cases where peritonitis arises without ruptured bowel. If, however, fæcal extravasation be the cause of the peritonitis, then the pain immediately becomes intense, often agonising, indeed pathognomonic of that occurrence.

Prognosis of strangulated hernia.—Hospital experience must not be regarded as a fair criterion by which to judge of the mortality induced by the effects of strangulated hernia alone. The high rate of mortality observed in this class of patients can only be considered as the result of the nature of the cases admitted into hospitals for treatment. In a large proportion of them the prospects of saving life are passed before the sufferers even leave their homes. Men and women labouring under the most adverse circumstances, irrespective of the particular disease under observation, are, for the most part, the class of sufferers submitted to treatment. Their constitutional powers have been previously and irreparably reduced by habits of life, places of residence, persistent recklessness, and usually by compulsory submission to almost every condition the reverse of those conducive to health,—such are the cases hopelessly seeking to be cured. These facts alone are sufficient to account for the mortality which occurs in our hospitals in cases of strangulated hernia requiring a cutting operation to liberate the bowel.

Undoubtedly it is to the length of time which the bowel is allowed to remain strangulated, and to the delay in the performance of the operation for its liberation, that the high rate of mortality must be generally attributed. This circumstance cannot be too strongly impressed upon the mind of the patient; nor can the medical attendant act too promptly in the employment of the only treatment which can avert such untoward results.

The late Mr. James of Exeter was evidently surprised at the mortality occurring in the hospitals of London when he observes: 'There can be little doubt that the majority of these fatal cases (of hernia) were the victims of time; . . . . this, I am aware, is an error little imputable to the distinguished surgeons by whom these operations were performed. It is generally the unfortunate patient who is the cause of his own disaster.'*

This statement very truthfully represents the state of the case, in some instances, without doubt,—in those, for example, in which the patient, being conscious of the existence of the rupture, conceals that knowledge from his medical attendant, or refuses all interference beyond external or internal therapeutical agents. It does not remove the imputation of neglect from him who, when the case is under his medical care, leaves his patient for several hours in suffering; nor can it justify the delay which is caused by a surgeon who, duly appreciating the nature of the illness, refrains from liberating the constricted bowel, or asking others to do so, after appropriate means have been unsuccessfully employed to return it by the taxis.

We have never known an instance of a patient dying in consequence of the bowel being liberated at too early a period; but we have had to operate upon many whose chances of life were absolutely sacrificed by the inexcusable delay which had occurred before the patient was submitted to the operation. We make this assertion after a large experience, extending over many years.

Why is it that the mortality attending strangulated hernia is so large? How does it happen that every writer upon this disease and every hospital surgeon has to deplore the condition of patients subjected to the operation for the liberation of the bowel? The average annual mortality in this metropolis caused by hernia, and published by the Registrar-General, amounts to 148.† This average is calculated from the total number of deaths from this cause registered during the last thirteen years. The highest number recorded is for the year 1862, viz. 170; the lowest in 1850, 128. We may assume that the increase of population, and greater accuracy on the part of those certifying the causes of death, may account for the difference between these extremes,—42. Now, judging from the condition of the cases which have come into hospital under our own care, we believe we are correct in stating that the mortality might be reduced at least by two-thirds if the liberation of the bowel was effected immediately after the failure of judicious attempts to reduce the hernia by the taxis, assisted by proper means, or soon after the vomiting of fluids regurgitant from the intestinal tube. We do not hesitate to pronounce this judgment after carefully ascertaining the facts of the cases which have fallen under our own treatment. For example, in inguinal hernia: of eight fatal cases, three were incurable in consequence of the condition of the bowel, irreparably diseased by long-continued constriction; two others were in a similar state from the bowel having been injured by violent compression employed to reduce it. Cases of femoral hernia are even still more fatal from the causes above mentioned. In twenty out of twenty-eight, the immediate cause of death was attributable to the disease of the bowel which had formed the hernia; this morbid state depending upon injury, over which the mere liberation of the bowel exerted but slight influence towards repair. For it should be remembered that the simple replacement of the viscus in the abdominal cavity does not ensure the restoration of its functions; the surgeon only replaces it in that situation where the reparative powers of nature are most likely to exert their influence with activity; and that if the tissues of the hernia when reduced are incapable of performing their functions, those of the intestine cannot be performed, and therefore death must ensue. In several of these cases the disease of the bowel was rendered still more surely irreparable by the pressure to which it had been subjected in the taxis; and in two instances the

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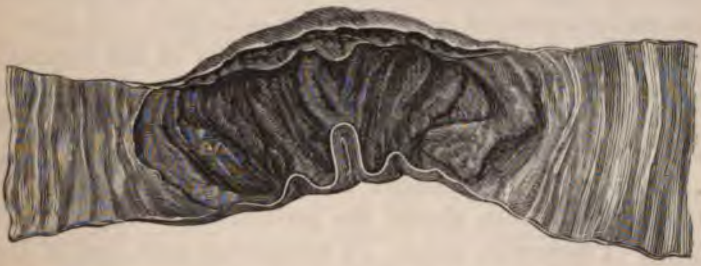
* *Practical Obs. on the Operations for Strangulated Hernia*, p. 79, 8vo, 1859.

† *Summary of Weekly Returns of Births and Causes of Death in London*; published by the authority of the Registrar-General, 1863.

Fig. 267.



This woodcut represents the injured tissues of a knuckle of small intestine which had been violently contused during efforts made to reduce it. The dark shade between the serous and mucous membranes represents blood extravasated in the walls. The whole of the knuckle was gangrenous although it had been strangulated only a few hours. The lines of ulceration in the mucous membrane are distinctly seen. (Copied from a coloured drawing and preparation in Guy's Hospital Museum.)

damage inflicted by this means was so great as to have absolutely killed the entire coil of intestine which was in the sac, fig. 267.

But all the causes which produce the morbid conditions of the bowel above mentioned, and more fully detailed in preceding pages, can be prevented. They may not be always under the control of the medical attendant, nor amenable to surgical skill; but we confidently promulgate the doctrine that the salvation of life in cases of strangulated hernia entirely depends upon the liberation of the bowel at the earliest moment practicable; and the converse may be predicated, that the destruction of life will inevitably ensue in proportion to the length of time the constriction has existed, with its constitutional consequences, and the prolonged and forcible taxis employed.

The vital importance of liberating the bowel from constriction at the earliest moment cannot be over-estimated. As upon the speedy accomplishment of this the salvation of life depends, a little precipitate action may even be forgiven, so hazardous is the position of a patient with the bowel strangulated. But, what is the risk attending the operation of exposing the hernial sac, dividing the impediment to the reduction of the hernia, and reducing it, even should the peritoneal sac require to be opened? Practically, none. In comparison with that of leaving the bowel strangulated, it is harmless.

To what cause, then, may we attribute the culpable negligence of those who leave the poorer classes of the community in this most perilous moment—in a condition replete with jeopardy, fraught with results hazardous in the extreme? It would seem that the embarrassment and the delay are caused, not by surgeons being timid and slow to propose a remedy, but from their really being ignorant of the amount of mischief certain to arise by allowing the constriction of the bowel to continue.

We once heard a physician relate the following circumstance: Being asked to see a poor woman who had been vomiting for several hours, he discovered a hernial swelling. He suggested that a surgeon should immediately see the case, intimating that an operation was urgently needed. The gentleman in attendance replied, 'But will it not be desirable to wait until the vomiting has ceased before the performance of the operation?'

Can any principle be deduced from the facts detailed, to serve as a guide in determining the moment at which the attempts to reduce the hernia by the taxis should be given up, not only as hopeless of good results, but fruitful of pernicious effects, and a cutting operation be urged as the only safe means to liberate the bowel from constriction? We may certainly now assert this without fearing the accusation of too great precipitation: when the period has arrived at which it is certain, from the nature of the fluids vomited, that regurgitation of the contents of the duodenum and jejunum has taken place, any delay in effecting the reduction of the bowel is certain to be attended with progressively increasing evils. If there be evidence of regurgitation from the ileum, the condition of the patient is still more hazardous. Even assuming that the case be now seen for the first time at this period, and that attempts have not been made to reduce the protrusion, delay is inadmissible. The administration of chloroform should be recommended at once, with an understanding between the patient and the surgeon that the operation should be immediately performed if, when its anæsthetic effects are fully developed, he fails to reduce the hernia by manipulation.

M. Desault, fully appreciating the injury too often inflicted on the hernia by the injudicious and violent employment of the taxis, wrote: 'Always think favourably of a case of strangulated hernia when the taxis has not been used.'

About two years since I operated upon a case of femoral hernia in a woman who had been labouring under symptoms of strangulated intestine for fourteen days. This was carefully ascertained. The bowel was thickened and like a piece of leather. Taxis had never been employed, and this patient recovered perfectly.

Treatment of irreducible hernia. Reduction of the hernia by the taxis.—The endeavour to reduce the hernia, which consists in displacing it from its abnormal position, and passing it through the orifice of the sac into the peritoneal cavity, by dexterous manipulation, is termed the use of the taxis. Of course, the first desire upon the part of the surgeon is to accomplish this feat. But all attempts to replace the bowel in the abdominal cavity should be relinquished until the circumstances attending the special case under observation have been carefully ascertained and considered.

The principal circumstances to which attention should be directed are as follows:

1. The kind and variety of the hernia regarded in its anatomical relations.

2. The duration of its existence;
ing and slow formation, or of recent

3. The constitutional condition of
diate moment, as influenced by the
at which vomiting commenced; and
taken place in the composition of th
determined with exactitude.

4. The state of the tumour. Its u
illness; its bulk before vomiting
which have taken place in it durin
which it gives rise, if merely local or
men, with or without manipulation;
ings; its probable contents, so far
the evidence, assisted by touch and s

5. The treatment already adopted
or other persons, before the observati

These are all subjects upon whic
serious meditation are urgently dema

Injurious effects produced by the tax
once more that irreparable injury i
the herniated bowel by violence, use
ness. The danger of any mischie
the taxis increases in proportion to t
has been strangulated. This necessa
of the viscus becoming less and less
of the hand in consequence of a mo
striction.

The principles by which the surg
when he is desirous to reduce a hern
knife, or by the taxis, are these:

1. Before vomiting commences.
judgment to abstain from manipulat
stage, and until other remedial mea
with the object of forming a corr
nature. The taxis, unassisted, often
truded viscus, and in many cases up
quired to operate, patients have sta
not commence until after the use
pressure of the tumour. If the case
forming hernia, commonly reducible
painful and larger than usual, for a

ld be enjoined to lie on the back, the pelvis being elevated, the knees flexed. Or, in other words, the abdominal les must be relaxed, by posture, as much as possible. n fomentations are to be disposed over the region of the h and neck of the sac, especially in children; and the tu-, if it be a scrotal hernia, supported, or never allowed to ndent, thus dragging on the neck and mouth of the hernial y its own weight. The lower bowel may be induced to y itself by administering an enema of warm water with a flexible tube, and tincture of opium should be given in suitable to the age of the patient. It is desirable, how- that a full dose be given to adults: and with this view y drops diluted with camphor-mixture is not too large a tity. A few hours may be allowed to pass away in order ord time for this treatment to take effect, unless urgent toms arise.

ne patients cannot maintain the posture just described, might be highly injudicious to enforce it. The principle axing the abdominal muscles may then be carried out by ing the patient to lie on the side of the trunk; but even the hernial tumour must be carefully supported.

der the influence of this treatment the patient very often sleep, and on awaking finds that the protrusion has re- d into the abdominal cavity. Now, should that happy not have occurred, it will be desirable to manipulate the ar, gently, which perhaps has become soft and flaccid. must be done upon some fixed principle. A successful will not accrue unless the pressure employed be directed ntelligence. The anatomical relations of the protrusion he mouth of the sac and the apertures in the abdominal must be carefully considered; and the course or direction the hernia takes in its descent should be strictly regarded efforts undertaken with a view to its reduction. The t must be disposed in a posture to relax all the abdominal es which can in the slightest degree contract around the of the sac. This part of the sac and its neck should be as far as practicable, with the fingers of one hand, whilst ndus of the tumour is held in the palm of the other. roceeding can only be adopted when the tumour is large. bject desired by the manipulator is twofold: first, to the mouth of the sac; and, secondly, to diminish the bulk protrusion. The area of the orifice of the sac may be

enlarged by employing the widest
tumour as a fulcrum, over which th
part of the sac may be stretched.]
treatment, the size of the protrusion
tially emptying the tube of its conten
congested blood-vessels: and, in som
sac is lessened by pressing the sero
into the peritoneal cavity. That flu
the operator is enabled to exert a mo
hernia.

2. During the stage of vomiting.
be always on his guard in the use o
is coincident with a hernial protrusi
indeed, the vomiting has lasted, the
pulation of the tumour. If before tl
ing delicacy of handling be importa
is the necessity for gentleness when
as indicated by the symptoms, can l
ing occurred, the tissues of the
healthy, and the damage inflicted b
state. After vomiting, especially if
hours, and it has become fæculent,
dered morbid by the constriction to
jected. Ill-prepared, then, are th
and the effect of violence will sure
them.

The measures which were emplo
the surgeon to apply the taxis with
generally prescribed at this stage o
more than simple mention here.
in favour of opium. There is one
tration is attended with decided
watching cases of strangulated her
rectly noticed that there is a sh
continues until regurgitation takes
tines. This occurs when the stom
of vomiting two or three times. I
a full dose of opium in solution
administered, the hernia may so
taxis. But when once the vomiti
an undeniable fact, the inward ad
pernicious.

We believe the statement to be correct, that all other modes of treatment have been abandoned in favour of the administration of chloroform. Why? it may be asked. An analysis of the effects of those therapeutic agents formerly in vogue shows that they exerted an influence over the constitutional and local causes preventing the reduction of the hernia, similar to that which is now accomplished by chloroform more speedily, more certainly, with less risk to life, and under circumstances much more within control. The constitutional remedies were bleeding, the warm or hot bath, and tobacco-enemata; all of which exert a powerful but uncertain influence over the vascular, nervous, and muscular systems; on which account they cannot be employed without some risk arising from effects which are often uncontrollable and persistent for a longer period than is desirable. But the anæsthetic qualities of chloroform, together with the complete suspension of all voluntary muscular action induced by the inhalation of its vapour, renders this therapeutic agent of inestimable value, especially in those cases in which the abdominal apertures are under the influence of muscles controlled by the will, as well as stimulated to involuntary contraction by local irritation.

It is especially beneficial in all kinds of inguinal hernia. Its good effects are most striking in cases of hernia into the vaginal process of the peritonæum occurring in infants and youths, as also in those varieties developed slowly in adult life, and which have existed many years. In fact, the operation for the liberation of a strangulated inguinal hernia in middle age and elderly adults, is now rarely required in comparison with the frequency of its performance in past years. As soon as voluntary muscular contraction ceases, then the tumour gradually becomes softer or less elastic, under gentle and well-preconcerted pressure, smaller and of different shape, until at last the hernia escapes from the embrace of the mouth of the sac with a sudden jerk.

The sensation the surgeon experiences when it quits the sac and enters the peritoneal cavity is very peculiar and striking. So characteristic is this of the complete freedom of the bowel from constriction, that in its absence the expert surgeon immediately suspects that all is not quite right.

Usually, vomiting ceases after the reduction of the hernia at once. Occasionally, however, it may continue from the effect of the chloroform alone; but the pain in the abdomen is imme-

The introduction of every kind o
the stomach must be scrupulously
strangulated bowel. When swallowe
vomited; and therefore it is someti
these circumstances they cannot pr
however, is not always the case. W
ensue from diarrhœa quickly superv
been reduced, the exciting cause o
repeatedly swallowing purgative med
vomiting.

A purgative enema seems to exert
ally. But after one has been used
attack, a repetition of this treatmen
majority of cases.

Many other local and constitution
ployed with the intention of assisting
and with occasional benefit. But t
attends their employment; the dis
gressive in the herniated viscus; an
accompaniment of continued strang
its attendant consequences—deter th
persisting in entertaining the hope
sion by the taxis, after chloroform h
and the hernia remains unreduced.

Herniæ have been replaced whils
ordinary position of the trunk, by ke
ground and the pelvis upwards. A
this posture (head downwards) by h
man, or over the side of a high b
knees are at the same time flexed.
encircling the mesogastrium with a
and at the same time drawing the c
from below upwards, whilst the p
posture.

When the hernia is but recently
object to reduce it as speedily as
operation, any method suggested wh
fully employed is perhaps worthy of

Injuries inflicted and accidents occu
These affect the following structures
tion; but we may consider indepen

Those affecting the hernia; those affecting the sac; and those involving the tissues covering the sac.

The hernia, whether consisting of a hollow or a solid viscus, may be bruised, and its blood-vessels ruptured. Under these conditions blood is extravasated into the tissues composing it, producing either patches of ecchymosis, or, when an enterocele exists, layers of effused blood appear between the different coats of the viscus.

The tissues of the bowel being most delicate, they are more commonly subjected to irreparable injury by violent taxis than the omentum. The presence of this structure, perhaps, often tends to prevent the serious mischief just described. The degree of irreparable injury inflicted on the bowel cannot be accurately estimated by the length of time the symptoms of strangulation have existed. Much rather does it depend upon the violence and prolongation of the attempts employed in the taxis. At any moment during the first twenty-four hours succeeding the first act of vomiting, the entire portion or coil of bowel in the sac may be so disorganised by pressure, that its vitality is entirely destroyed, and so literally killed, that nature throws off the part by the processes usually attending the separation of living from dead tissues. Under these circumstances, the entire calibre of the canal is divided, and an artificial anus is formed: or death takes place in consequence of extravasation of the stercoraceous material into the peritoneal cavity. Sometimes the tissues of the bowel are cut by pressure against the orifice of the sac, or the structures surrounding it; as in femoral hernia, against the free edge of Gimbernat's ligament. (See Fig. 267.)

After the expiration of twenty-four hours, the constriction to which the bowel has been exposed having led to inflammatory effusion into and softening of its textures, there is great risk of bursting the tube. This rent usually occurs at the convex border of the gut, at the farthest point from the mesentery, and corresponds with the direction of the circular contractile fibres.

Another effect of violent compression is to cause the mixture of blood and coagula with the serum in the sac, and flakes of lymph or puriform effusion arise from the same injurious interference. The local and constitutional indications of these injuries have been described in a preceding page.

Injuries of hernial tumours by accidental violence.—We may here briefly describe the treatment of those injuries which happen to hernial tumours from accidental circumstances, during the pursuit of the ordinary avocations of individuals afflicted with reducible as well as irreducible ruptures. The reader will derive more information on this subject than it is possible to introduce here, by the perusal of a most interesting paper, entitled 'On the Proceeding to be adopted in a Case of Injured Intestine from a Blow on a Hernial Sac,' by the late Mr. Aston Key.*

A simple contusion is the mildest form of injury. Should the signs of more severe mischief be absent, the hernia may then be returned. It is important, however, that the patient abstain from bodily exertion, and the alimentary canal be kept in a state of repose. If the violence of the blow have been sufficient to cause inflammation and ulceration of the gut, the slightest indication of any such secondary mischief must be watched with the most anxious care, and the favourable moment seized when an incision into the tumour will allow the escape of the contents of the alimentary canal, and by this proceeding avoid the risk of extravasation into the peritoneal cavity.

But when there are plain indications that the primary effect of the violence has been to lacerate the intestine, which by chance was contained in the sac at the moment the injury was inflicted, time should not be wasted in adopting palliative measures; but the hernial sac must be freely cut open, and thus a ready means of escape be made for the stercoraceous fluids. The symptoms indicating a wound of the intestine are described in Vol. II. p. 670 et seq.—WOUNDS OF THE INTESTINE.

Another variety of injury of a hernial tumour is when the patient has an irreducible epiplocele. The omentum is adherent to the mouth of the sac, and entirely blocks it up, as it were, whilst the body of the sac remains as a simple closed serous cavity. A contusion of such a tumour excites inflammation and suppuration within the sac. Considerable embarrassment may be experienced in precisely diagnosticating the exact nature of the disease.

Injuries of the hernial sac.—There are two varieties of injury which produce important effects on the sac containing the

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* *Guy's Hospital Reports*, 1842, vol. vii. p. 261.

rnia. Both of them render a case of strangulated hernia
ceedingly complicated and embarrassing. The violence caus-
g the mischief may be applied to the tumour either by the
fferer or another person; but considerable force is requisite
rend or tear the tissues composing the sac, or to separate it
om its surrounding connections. These injuries more fre-
ently happen in association with long-continued pressure
an after short trials of the taxis. The two varieties are as
llows:

A. *By displacement.*—The sac is detached, to a greater or less
tent, from the surrounding structures. Those parts of the
c called the orifice and neck are more frequently affected by
is injury than any other portion. They become detached
om the inner surface of the internal abdominal fascia.
gether with these, that portion of the parietal peritonæum
mediately circumjacent to the sac's mouth is also severed
om its attachments, and in this manner a pouch is formed
ithin the fascial membrane of the abdomen, into which the
rnia may be forced; and being retained therein, is lost to
uch and sight. Sir Charles Bell has recorded a case which
ustrates this injury.*

It is stated that the entire hernial tumour may be pushed
ithin the abdominal walls, in a mass, whilst the hernia is
ill strangulated by the orifice of its sac. This injury was
st described by French writers, under the appellation of 'ré-
ction en bloc.' However, more recently, examinations made
ter death indicate other lesions to be the probable causes of
e disappearance of the hernia, in some cases; and certainly
ford conclusive evidence that such an accidental disposition
the sac, when strictly examined in an anatomical point of
ew, must still be regarded as a very rare occurrence indeed.
e refer the reader to Mr. Luke's paper for further information.†

In offering the following explanation of many of these cases,
e court the inquiry of future observers, to support its correct-
ess or to prove it to be erroneous. The tissues of the scrotum
re very loose, and readily change their position. Every
bserver must have noticed the variable length of the sper-
atic cord, between the external abdominal ring and the
estis, at different times. The hernial sac, attached to the

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* *Lond. Med. Gaz.* 1828, vol. i. p. 485.

† *Med.-Chir. Trans.* 1843, vol. xxvi. p. 159.

anterior surface of the spermatic cord, also varies in length
like manner. When the hernia occupies the sac, the latt
extends lower than when it is empty, in which last state
perhaps only just emerges from the inferior outlet of the
guinal canal. Now let its mouth and neck be detached fr
the internal abdominal ring, and the hernia still strangula
by the margins of the orifice be pushed inside the abdomi
walls. The fundus of the sac attached to the tissues of
scrotum is not on this account severed from those connecti
but merely ascends towards the inguinal canal, and lies
tially within it with its walls in close contact, which, be
rather thin, are not very recognisable. The fact that this
of the hernial sac has been often found in this situation du
the progress of an operation for the liberation of the stran
lated gut, is attested by the reporters of those operations.*

B. *By laceration or bursting.*—As the effect of forcible
long-sustained compression of the hernial tumour, the deli
serous membrane of the sac is rent, burst, or torn, and the her
makes its escape through the aperture into the subserous c
nective tissue. Its course outside the peritoneal sac is advan
by continued pressure; and detaching the connections of
neighbouring peritonæum, it forms for itself a pouch betw
that serous membrane and the internal abdominal fascia.

The part of the sac a little below its abdominal orifice
mouth, usually styled the neck, which lies in the ingui
canal, is most frequently burst along its posterior surfa
This injury is more commonly produced in that variety
inguinal hernia, the sac of which is constituted of the vagi
process of the peritonæum, whether the hernia be in cont
with the testis or not. It is inflicted with remarkable facil
when the patient is fully under the anæsthetic influence
chloroform, especially if he be also youthful. This accide
is easily imitated, after death, upon a subject in which the ne
of the hernial sac happens to be rather long, by cutting
opening in its posterior wall, and pushing the finger in a bac
ward direction. The course which the finger takes is that o
which the hernia would pursue.

The indications of the accident having taken place are a
follows: the tumour becomes flaccid, and therefore smaller
which alteration in its features is probably owing to the serum

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* *Med.-Chir. Trans.* 1859, vol. xlii.; see tables at end of paper, p. 278.

which the sac contained being squeezed through the rent into the connective tissue around the sac; the bulk of the tumour slowly diminishes as the pressure is continued, until at last very little, if anything, can be felt, but the surgeon has failed to experience that sudden jerk so characteristic of the escape of the hernia from the gripe of the mouth of the sac, as it enters the abdominal cavity; and if he have had much experience of the reduction of hernial protrusions, doubts will arise in his mind as to the probable direction this one has taken. After the effects of the chloroform have passed away, all the symptoms of strangulated bowel recur, and perhaps with increased force. Even the tumour itself may reappear, and recede on the application of slight pressure.

Now all these circumstances are highly characteristic of the accident that has occurred; and there remains but one proceeding to be adopted immediately. It is this. The hernial sac must be exposed and opened. Perhaps it may appear to be empty; and even the finger passed upwards and along the inguinal division of the sac enters a cavity through a well-defined aperture, in which intestine is felt. This abnormal aperture may be mistaken for the internal ring and the cavity into which it leads, that of the abdomen. Acting upon this belief, however, would lead to the commission of a fatal error; one which, if not detected at the moment, will surely compromise the life of the patient. An effort must now be made to draw the bowel out, if it does not come forth spontaneously; and when this is accomplished, the true mouth of the sac will be discovered by passing the finger upwards along the anterior surface of the mesentery. By the orifice of the hernial sac the protrusion is firmly constricted. The constricting tissues, therefore, require to be cut; after which operation, the exercise of great care and caution is needed to prevent the entrance of the hernia once more into the abnormal space outside the peritoneal cavity. As the salvation of life depends upon the return of the protrusion through the natural orifice of the sac, considerable freedom in the use of the knife is justifiable, if the attainment of the desired end is thus facilitated, and the risk of failure in doing this thereby removed. All cases of this description not only give rise to great embarrassment and difficulty, but they are also associated with very unfavourable consequences and results.

Injuries to the coverings of the hernial sac.—A very short

description will suffice to indicate the nature and effects of t
injuries inflicted on the tissues covering the sac by the use
unjustifiable violence in attempting to reduce a hernia by t
taxis. We have seen the results of contusion; namely, eccl
mosis of the integuments; extravasation of blood and œdemat
infiltration into the subcutaneous tissues covering the sac; a
inflammation of all the structures together, passing on to su
puration, sloughing, and phlegmon, extending to the nei
bouring regions. Those local morbid conditions require
ordinary topical measures suited to them.

The disappearance of the hernia in consequence of its pas
from one sac into another;—intra-parietal.—We may here all
to those rare cases of inguinal hernia which are complica
with an intra-parietal sac. Anatomically examined, the her
sac in these cases consists of two parts; that division wh
passes along the inguinal canal into the scrotum, and that
which is lodged in the walls of the abdomen. A full descript
of these curiously developed sacs is given in the section of
paper devoted to inguinal hernia. Now when the hernia
strangulated by the ventral orifice of the sac, and it occu
the scrotal division, it may be pushed by the taxis, even w
employed with the utmost care and skill, into the other
and thus, the tumour disappearing, the surgeon considers
hernia reduced. The constitutional symptoms, however, quic
indicate that this is not the case. By inducing violent act
of the abdominal muscles, or making the patient stand er
the hernia will sometimes reappear. Under any circumstan
the liberation of the bowel is demanded, and in the necess
operation to accomplish this end great care is required to av
passing the bowel from one sac into the other, instead of i
the abdominal cavity.

The operation for the removal of the impediment to the reduct
of the bowel, or the liberation of the hernia.—The culminat
point in the treatment of every case of strangulated enteroc
is reached when the impediment to the reduction of the bo
must be removed by a cutting operation. This of course occ
after the failure to reduce the protrusion by the taxis.

The part of the practical surgeon is not only to know tru
but to apply it; and, however repugnant to the feelings of t
patient, or creative of alarm the thoughts of an operation m

be, it is his paramount duty to urge concurrence in this step, as it alone offers the surest prospect of the salvation of life.

By too many medical men the cutting operation seems to be regarded in the light of a last resource, and one which it is improper to use until the danger to the life of the patient appears imminent. But the sooner that this fatal error is eradicated, the sooner shall we discover upon what fallacious views it has been based. We believe that death resulting from strangulated bowel would be a rare occurrence, if it were practicable to return every strangulated enterocele within twelve hours after the commencement of the symptoms, even assuming that the cutting operation be required to accomplish that end in every case. For let this conviction be firmly impressed upon the mind, that death results not from the operation, but because the operation was not performed at the right moment.

Every medical attendant upon a case of strangulated hernia should reflect on these indisputable facts, that so long as the viscus remains in that condition the life of the patient is slowly ebbing; that to his judgment and foresight has been committed the safety of the sufferer; and that upon his discretion, firmness, and resolution hangs the fatal issue. For it is no exaggeration to say, that each minute as it elapses carries with it the chances of recovery further and further away.

We hope that the mortality arising from strangulated hernia is not now so large as it once was.* Nevertheless, at this moment it is excessive; and when we know, and all professing surgery should know, how surely the liberation of the bowel tends to save the life of the patient, why is it not done the moment all other measures have failed to replace the gut in the abdominal cavity? Some medical men do not seem to be sensible of, or to appreciate the vast amount of injury which is certain to accrue from the persistent vomiting, nor to value the indications derivable from the character of the vomit. They most assiduously attempt to check the vomiting by administering medicines; but they utterly reject, at the suitable moment, the only means by which it is to be arrested.†

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* Mr. Hey states, that when he entered upon the profession of surgery, now 100 years since, 'the operation for the strangulated hernia had not been performed by any of the surgeons in Leeds;' and he adds, that he 'lost three patients in five upon whom the operation was performed.'—*Practical Obs. in Surgery*, 3rd edit. 1814, p. 129. Are the results of the treatment of strangulated hernia more successful at the present day? We fear not.

† We may have expressed our views a little strongly, and thus laid ourselves

The operation, kelotomy, herniotomy. The first part o
operation consists in cutting through all the tissues cov
the hernial sac, carefully recognising their characteristi
they differ in the special regional varieties of hernia. H
reached the sac containing the strangulated viscus, the ope
now determines upon the propriety of opening it and exp
its contents to sight and touch.

If he determine to cut the sac open, it should be done i
manner. The body of the sac is nipped up between the
and thumb, and with exceedingly great care, to avoid a
same time including the walls of the bowel. An op
sufficiently large to admit a grooved director is next made
a scalpel, the sharp edge of which must not be directed to
the contents of the sac, but laterally. The side of the
should be placed nearly flat on the tumour. By this ma
ment of the instrument, all risk of injuring the intest
removed. A grooved director having been passed through
opening and firmly held against the inside of the sac, r
indeed stretching its tissues over it, they are freely div
upwards and downwards, or towards its orifice and fundus.

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open to criticism and animadversion; for we confess to have been a
influenced whilst writing these lines by an occurrence which took place
time of doing so. A fine woman for her age, which was seventy-one
known to be the subject of strangulated femoral hernia, was allowed to
persistently for between ten and eleven days. At this time she was sent
hospital 'for the operation,' which necessitated a journey of several miles.
arrived cold and pulseless, though intelligent; the abdomen was tymp
she was in fact moribund. As soon as practicable the liberation of the
was effected. The escape of purulent fluid from the abdomen was suffic
characteristic of the condition of the peritoneal cavity. In spite of w
applied to the surface of the body and stimulants administered internally
expired in a few hours after admission. Yet, during the ten days prec
medicines had been prescribed to arrest the vomiting, taxis had been frequ
employed, and the marvel was, as a friend who accompanied her express
that she reached the hospital alive. What other result than death could
been anticipated? *Ten days'* vomiting, and starvation for the same period
surely enough to destroy life at the age of seventy-one years; but, in addi
she had a perforating ulcer at the point of junction of the upper division o
alimentary canal with the hernia, extravasation of stercoraceous matter,
diffused peritonitis. Nor is this case an isolated example of culpable neglig
Instances already recorded in books, and abundantly exemplified by reports i
weekly medical journals, abound in the metropolitan and provincial hosp
Such misfortunes—for we deem it to be a misfortune that hospital surgeons
to treat cases of this kind—would never occur if the medical attendant could
be made to feel that his patient lies within the jaws of death until the intes
is returned into the peritoneal cavity.

Usually the escape of more or less serum is a sufficient indication that the hernial sac has been opened. But the operator should not be thrown off his guard by an absence of serum, when the sac has been cut, any more than by seeing a flow of fluid when it has not been even reached. The latter somewhat rare occurrence is due to the development of a cyst upon the hernial tumour, and is at once explained by passing the finger into a circumscribed cavity. For the variable conditions of the serum, see page 683.

When an enterocele is under treatment, the intestine is brought into view as soon as the sac is opened; but in an entero-epiplocele it often happens that the omentum only is exposed. The surgeon then carefully raises this structure, for the bowel lies underneath it in the majority of cases. It is wholly enveloped by it in some instances, when that arrangement termed an omental sac exists. In this case the omentum requires to be carefully unravelled. We employ the last word in order to insure the use of much care and caution in the division of its tissues.*

The condition of the bowel should be now carefully ascertained, for by the morbid state of its tissues the surgeon determines upon the propriety of placing it within the peritoneal cavity, or allowing it to remain outside of the abdomen. Simple adhesions of the bowel to the body of the sac may be gently broken down; but the greatest caution is required in this treatment of the hernia where it lies within the orifice of the sac, as by rough manipulation its tissues may be torn, when extravasation of the contents of the tube into the peritoneal cavity will take place. If the bowel is ruptured, it must be confined to the edges of the wound by sutures.

To reach the impediment to the reduction of the hernia, the point of the index finger is now directed upon the anterior surface of the mesentery, towards the mouth of the sac. Should the end of the finger pass freely through the ventral orifice of the sac into the peritoneal cavity, when introduced with great gentleness, an attempt may be made to reduce the hernia without cutting this part of the sac. In the manipulation of the bowel great delicacy is required. The surgeon gently presses the distended coil, and if its fluid or gaseous conten escape into the continuity of the canal, it soon becomes flacci This condition may be regarded as an indication that the pr trusion is reducible without cutting the orifice of the sac. (the contrary, if after delicate and continued digital pressure t knuckle of intestine continues to be tense, elastic, and roun the surgeon decides to enlarge the mouth of the sac by cutti it. Operators with little experience would do well to make u of a grooved director. This instrument is carefully passed up the anterior surface of the hernia, its direction being guided the index finger of the left hand. It should be introduced i the abdomen sufficiently deep to be entirely clear of the co striction formed by the tissues around the protrusion, but n further. Careful examination is necessary at this step, ascertain that the bowel does not overlap the borders of t director, nor lie between it and the anterior region of the ne and orifice of the sac. To avoid all risk of injury to the bow when that viscus is quite clear of the groove in the director, t instrument should be firmly pressed against the tissues whi are about to be cut. A bistoury, specially constructed for t operation, is gently glided along the groove on the direct and a slight resistance is usually encountered as it pas through the constriction, which, however, yields as the cutti edge reaches, and in its passage divides, those tissues whi cause the impediment to the reduction of the hernia.

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* A very interesting paper on these 'omental sacs,' written by Mr. Prescott Hewett, is published in the *Med.-Chir. Trans.* 1844, vol. xxvii. p. 282; and another, on a case of scrotal hernia, with compound omental sac, in *Path. Trans.* vol. iii. p. 98.

When those tissues are firm and rigid, a sound is produc or a peculiar sensation is felt, on dividing them, resembli the cutting of thick leather. The operator now employs t index finger to examine the opening he has made. If it fe sufficiently large to admit the passage of the hernia, he ne attempts its reduction; if it prove still too contracted, t bistoury may be passed along the finger and the incision i creased. The impediment to the reduction of the hernia bein thus entirely removed, its replacement within the abdomin cavity is easily effected.

The following, then, are the principles upon which every ste of the operation must be based: minute anatomical knowledge the exercise of deliberate consideration and judgment; th recollection of the necessity for practical care, and for delicacy o manipulation, and of the importance of interfering as *little* a possible with the surrounding structures. Just so much mus be accomplished as is absolutely needed, and no more.

But we must revert to a few subjects merely alluded to in the preceding description of the operation.

Of opening the hernial sac.—When the anatomical relations of the hernial sac were carefully examined, it was discovered that the impediment to the reduction of the hernia was not in all instances caused by the narrow passage of the ventral orifice of the sac alone. Careful dissections showed that those structures which lie in close connection with the outside of its mouth and neck offered considerable obstruction to the retrograde passage of the hernia through those parts of the sac.

For the last hundred years surgeons of eminence have applied these anatomical facts to treatment, and many distinguished operators have dwelt upon the advantages to be derived from replacing the hernia in the abdomen without cutting open the peritoneal sac. On the grounds above alluded to, they have devised that mode of performing the operation for a strangulated enterocele called 'the division of the stricture without opening the sac,' or 'external to the hernial sac.'

The advocates of the operation believe its most favourable points to be as follows: the peritoneal cavity is not opened; the peritonæum at the mouth of the sac is not cut; the diseased intestine is not exposed to the influence of the atmospheric air, nor to the direct contact of the fingers of the operator; nor is the risk of hæmorrhage into the peritoneal cavity so great, should a large vessel be accidentally cut. They consider, then, that the operation itself is not attended with the same amount of danger as when the peritoneal cavity is opened, its parietal reflection cut, and the inflamed bowel exposed.

The simplicity of the proceeding commends the operation highly; for the wound inflicted is very little more than an incision through the integuments, and its advantages must have seemed paramount at a time when the dangers of the operation were exaggerated, and it was assumed that patients with strangulated hernia died from the effects of the operation itself.

Bearing in mind, however, that death occurs from the constitutional and local effects of long-continued strangulation of the bowel and its injury by forcible taxis, and because the bowel is not liberated by the operation early enough, the advantages of any particular mode of operating, especially of this one, are perhaps not quite so great as at one period many surgeons were inclined to admit. The method of performing the operation is quite a secondary consideration, in comparis with the importance of the early liberation of the bowel.

The opponents of this operation enforce their objections wi the doctrine that, when the necessity arises for any cutti operation at all, the fact alone is sufficient to demand an in sion into the hernial sac, in order to ascertain the cause of t impediment to the reduction of the hernia; and that an ope tion for the liberation of a strangulated bowel is not compl until that viscus has been carefully examined. They also gard the risk to be great of reducing the hernia, still str gulated by adhesions, omentum, or even by the orifice of hernial sac itself.

Next, pointing to statistical facts, and comparing the resu of the two operations as performed in different metropoli hospitals,—in those where the preference is given to open the sac in all cases, and in those in which the opposite pla pursued,—they maintain that the greatest success is obtai at those institutions where the sac is incised as a rule.

It is, however, quite clear that we are unable to collect a facts upon which to institute a safe comparison. Conclusions as the success of the one practice or the other, based upon t results of the cases under treatment, in the hospitals, are rea worthless, because the incidents in any two cases of hernia a never precisely alike, and accuracy, as to details, which absolutely required to arrive at the truth, cannot be obtained

We believe the dictum to be equally erroneous, when o surgeon says that in every case the sac must be opened, a another directs that it must not, except by compulsion. T proper practice consists in making a judicious selection of t cases: viz. those in which the operator opens the sac upo fixed principle; those in which he does not, because, acco ing to his judgment and experience, there is no necessity do it.

In many of the metropolitan hospitals the operation exter to the sac is performed in suitable cases, upon conviction of advantages; and although we dare not venture to say that so of the fatal cases which have occurred after opening the s might have terminated differently had it not been incised, do not hesitate to affirm, that the untoward circumstan stated as likely to happen, when the sac is not opened, have n occurred.

Doubtless every hospital surgeon to whom the opportuni occurs of frequently operating on cases of strangulated hernia, will be guided by his own judgment as to the propriety of opening the hernial sac in every case, or of leaving it intact in selected cases. But if we may be permitted to enunciate the principle upon which inexperienced surgeons may act with safety, it would be this. In all those cases in which the surgeon would deem it safe to return the hernia by the taxis, if it were practicable, he may do the same thing after he has removed the impediment to the reduction of the hernia, by cutting those tissues lying outside the sac which are the cause of that impediment. But in those cases in which the symptoms are suggestive of an aggravated morbid condition of the bowel, and on account of which it would be improper, nay hazardous, to attempt to reduce it by the taxis—in those the sac must be opened.

In making a suitable selection of the cases for the first plan, great discrimination is therefore required. We regard those cases to be favourable for the operation in which the symptoms of strangulation have existed but a few hours, and when they have not been very severe: when the vomiting is not stercoraceous, nor the patient very prostrate; when the tumour is a simple enterocele, and when it has escaped forcible attempts at reduction. Of course no cutting operation of any kind will be attempted until after the failure of well-applied taxis to reduce the hernia.

On the contrary, the indications for incising the sac are: a long continuance of the strangulation of the hernia; inability to empty the sac completely; the persistence of stercoraceous vomiting; the prostration of the patient; the compound conformation of the tumour (it being an entero-epiplocele); and after repeated, protracted, or forcible taxis has been used.

Guided by these facts, the number of cases in which the operation of division of the impediment to reduction of the hernia external to the sac may be regarded as preferable to any other, becomes very limited. But we cannot refrain from expressing our conviction, founded upon the results obtained in those cases in which this operation has been carried out, that it is easy of performance, free from the risks attributed to it, unaccompanied by some of those accidents which occasionally occur when the sac is opened, and most favourable to the rapid recovery of the patient. It must, however, be remembered that these are select cases, and belong to a class most favourable for recovery; and we cannot deny but that they would probably be successful, even should the peritoneal sac be cut open.

Nevertheless, the inquiry suggests itself, If the hernia can be reduced with safety without opening the peritoneal cavity, why should it not be?

Of the instruments required to perform the operation.—They are as follows:

1. An ordinary scalpel, with a single cutting edge.
2. Forceps.
3. A grooved straight director.
4. A grooved director, specially adapted for insertion beneath the tissues forming the impediment to the reduction of the hernia.
5. A bistoury of peculiar construction, with which to cut those tissues.
6. Retractors.

The *director* (4) and the bistoury (5) are the only instruments requiring special notice.

The *director* has been constructed after a great variety of forms—straight and curved; long and short; narrow and wide; with wings or lateral projections to protect the bowel from the knife; with and without a handle affixed; with a probe-pointed end or beak, with the groove terminated, near the end, by a stop, or without such a stop. That form of the instrument invented by the late Mr. Aston Key has been employed under our observation many years with advantage; and we are able, therefore, to recommend its use. It is usually known as Key's hernia director.*

The *bistoury* used to divide the tissues which constitute the impediment to the reduction of the hernia, wherever they may be situated, has been made in a great variety of shapes, lengths, and breadths, and usually with some contrivance, movable or fixed, to prevent its end and cutting edge injuring the intestine. It being impossible to describe every variety of the instrument, perhaps it will suffice to state the characteristics of a good one for safely performing this important part of the operation. It is desirable to have two bistouries at hand, one straight, the other curved. When the ventral orifice of the sac is deeply seated, the latter will be found very useful. In other particulars the two instruments resemble each other. The metallic part extends about 3½ inches beyond the handle. Its sides are ⅜ of an inch broad where it unites with the handle, and they gradually taper towards the end, where the breadth is ⅛ of an inch. The blade terminates in a button or blunt end. At the terminal ⅜ of an inch, the sides of the metal are bevelled off, and one edge is made to cut. This sharp edge should be slightly concave. All the other edges and surfaces of the metallic shaft are carefully rounded off and polished. Sir A. Cooper's hernia-knife has a cutting edge $\frac{6}{8}$ or ⅞ of an inch long, beyond which extends a blunt terminal portion ⅜ of an inch long. The objection we entertain to this knife relates to this long blunt beak, which must be passed into the abdomen before the cutting edge reaches the tissues which require division.

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* A drawing representing this instrument may be seen in Mr. Key's *Memoir on the Advantages and Practicability of dividing the Stricture in Strangulated Hernia on the outside of the Sac,* 8vo, Lond. 1833; Drawing 1.

When the index finger, of either hand most convenient to the operator, is employed as a director, its point is passed to the orifice of the sac, outside or inside; the bistoury is passed upon the anterior surface of its first phalanx, and the side of the instrument being pressed against it, lies in a depression on its soft parts. Thus the sharp edge of the knife is prevented from injuring the bowel. The end is then dexterously insinuated beneath the tissues to be cut; and as they slowly yield before it, the finger follows the direction of the knife, and the operator judges of the size of the opening he is making by the facility with which his finger passes into the abdomen.

When a metallic director is used, the bistoury is gently carried along the groove of the instrument.

Of the treatment of the strangulated intestine.—The primary object of every surgeon who has a case of strangulated enterocele under his charge, should be the return of the intestine into the abdominal cavity as quickly as possible. With this object in view, 'the operation,' as it is termed, is undertaken after the failure of all other means.

But there are certain morbid states of the bowel which preclude the operator from doing this, after the liberation of the viscus from the constriction to which it was subject. The morbid conditions having been already described (p. 677), we need only briefly refer to them here, in order to direct their treatment.

Commencing, then, with the worst condition, in which the entire knuckle of the intestine in the sac is dead, mortified, or

Aston Key advocated this plan of treatment. He did this upon the principle that the abdominal cavity was the place in which the injured bowel was more likely to be repaired than in any other. 'The danger of abdominal extravasation will not be increased by replacing the injured bowel at the neck of the sac; for, should sloughing of its coats ensue, the slough may be walled-in by adhesion of the surrounding peritonæum, and fæcal extravasation be prevented.'* When adhesions prevent this treatment it is better to divide the orifice of the sac slightly, and to leave the bowel in the sac. Under such unfavourable circumstances, patients occasionally recover without a fæcal fistula. An interesting case of this kind is published by Dr. Watson, in the *Edinburgh Medical Journal*, March 1870.

In some cases the operator encounters great difficulty in reducing the hernia, even after the mouth of the sac has been freely enlarged. This depends upon the following causes:

1. *Its bulk.*—The hernia sometimes consists of a very large quantity of intestine, which is distended with flatus; and although a portion is reducible, the reduction of the entire mass is impracticable. After the failure of these attempts, a plan may be pursued which was adopted by Mr. Tatum with complete success.†

The bowel may be punctured, and the flatus allowed to escape. Mr. Tatum used a grooved needle for the purpose; we would suggest the employment of the filiform trocar and canula. This instrument may be obliquely inserted through the tissues of the bowel, thus forming a valvular wound.

2. *Adhesions.*—These may be *recent* and *chronic.* The latter are often formed long antecedent to the conditions for which the operation was undertaken. In the recent state the adherent surfaces are usually easily separated, whether they unite the coils of the bowel to one another, to the sac, or to the omentum. When this morbid condition happens to the viscus *in* the body of the sac, there is not much risk of the interference making mischief; but when the bowel is adherent to the mouth of the sac, the condition usually indicates an advanced morbid state of the viscus. It is an indication that nature has made preparations to prevent extravasation into the peritoneal cavity, in the event of the bowel bursting from the distension caused by

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* *Guy's Hospital Reports,* 1842, vol. vii. p. 264.

† See INJURIES OF THE ABDOMEN, Vol. II. p. 666.

accumulations in that part of the digesti
Meddling with such adhesions is atte
tearing the bowel. The safest procedu
trusion, if possible, after having enlarge
but even allowing it to remain in the
striction, would be preferable to lacer
attempt to separate the adhesions, a
artificial anus. Recent adhesions to o
separated with ease. Flakes of adhere
left where found. By detaching them,
may be torn; and they frequently overl

Enteroceles of long standing someti
united to a part of the sac, although
cases the orifice of the sac is usually la
the bowel becoming strangulated prop
peristaltic action of the canal proceeds
with occasional inconvenience arising fr
in causing obstruction. Should an
two proceedings may be adopted: eith
may be enlarged, and the intestine l
adhesions of the viscera may be des
returned. The choice of these two pla
the condition of the viscus and the exte

3. *The depth and inaccessibility of the*
part of the sac which lies in close relati
toneal cavity is sometimes so deeply s
embarrassment arises not only in maki
in returning the hernia into the peri
has been done. By employing an assis
the opened hernial sac by its cut edges,
outwards, or from the abdomen, its m
slightly stretched. This manœuvre gr
duction of the protrusion.

Treatment of the omentum.—Omental p
rarely require the removal of the imped
by a cutting operation. But after the
in cases of entero-epiplocele, it often be
is to be done with the omentum.

The treatment is as follows: it may

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* Relating to these cases, the reader may con
and Inflamed Hernia, by Henry Stephens.

he sac; it may be cut off; or a ligature may be tied t.

rst proceeding would be generally chosen when practicn some instances, however, the great bulk of omentum, seased condition, necessitates a choice between either it in the sac or removing it.

are some disadvantages in leaving the omentum in the fat becomes inflamed; it suppurates, and sometimes ; the healing of the wound is consequently delayed, and r-treatment of the case thereby protracted. Usually, , the omentum shrinks up and contracts, and eventually nd heals, but with more or less of a tumour at the ial aperture. This swelling may interfere with the ul application of the pad of a truss. Some surgeons, , believe the remains of the omentum to be useful in ; up or plugging the ventral aperture.

emoval of either the whole or a part of the protruding n may be effected by cutting it away at once, or by ; a ligature around it near the orifice of the sac, and the portion below the ligature still attached, or cutting Besides, there is the alternative of leaving the truncated mentum in the sac, or of replacing it in the abdomen. exercise of due care, omental adhesions to the sac may y separated, whether recent or chronic.

omentum be cut off, there is great risk of bleeding cut vessels when it is replaced in the peritoneal cavity. ter every precaution had been taken to secure the blood- cases in which omentum has been excised have proved m internal hæmorrhage alone.

been assumed by some writers to be injudicious to tie re around the omentum, on account of the untoward vhich may ensue. But the reader should refer to Vol. 33, where he will find the good results of this plan of nt related by Mr. Pollock, as well as the mode of applyligature.

e kindness of the editor, Mr. Holmes, we are able to result of the practice of removing diseased or supermentum, after ligature, as performed at St. George's l. Of twenty cases of hernia in which the omentum urely tied, a few died; but the notes of the after-death tion of them show the cause of death to have been, in , independent of the ligature placed around the omenin the peritoneal cavity is the rapid relief from pain across the mesogastrium.

It is manifest that no single plan of treatment, to the exclusion of every other one, can be urged as applicable to all cases of hernia, after the liberation of the bowel. As the disease occurs at every age, in every variety of constitution, and under individual peculiarities of the most diverse kind, so strangulation of the hernia may happen with the idiosyncrasies and opposite conditions of youth and senility, strength and decrepitude, health and disease, temperance and intemperance. It must, however, be carefully borne in mind, when treating a case of this kind, that we have to deal locally with an injured intestine, and a penetrating wound of the abdominal cavity; and that the constitutional powers of the patient are greatly reduced by continual vomiting, starvation, suffering, and alarm.

In some youthful, robust patients the tendency to inflammatory action becomes, at an early period, strongly developed, whilst, on the contrary, in the aged and decrepit little disturbance may appear demanding interference.

The after-treatment has been conducted upon the most opposite principles. Surgeons of the highest eminence may be found amongst the advocates of the two methods, which may be briefly stated as follows:

In one class are those who administer purgative medicines almost immediately after the operation, and persist in their continuance 'until the canal is completely unloaded.' Calomel, extract of colocynth, sulphate of magnesia, and castor-oil, are given by the mouth, or aperient enemas injected into the rectum.

Another class, relying almost entirely upon the restorative powers of nature and the influence which repose exerts on the reparation of injured tissues, depends upon diet and, when required, opium.

In selecting one of these plans of treatment for adoption, we give the preference to the last, since it seems to be most suitable to the majority of the cases occurring in hospital practice. In many cases we have allowed the patient to recover without giving any medicine whatever; great care, however, being taken that a mild and farinaceous diet, with milk, be only sparingly taken.

This necessity for repose, writes Mr. Key, in an injured state of the bowel it would be well to bear in mind, after the operation for strangulated hernia.

The bowel is gorged by the strangulation, bruised by the taxis, as it is too o practised, or inflamed by long incarceration in the sac. An intestine in such a dition cannot but be injured by an early administration of purgatives, w irritate and inflame the bowel, or exhaust what little remains of vital ene After the operation, some time for repose should be allowed before the bow called into action: the surgeon's anxiety to procure stools should yield t evident necessity for time being allowed for the restoration of the natural po of the injured bowel.*

Great advantage is sometimes derived from the effect thirty drops of the tincture of opium, which may be given a little brandy-and-water, or camphor mixture, soon after operation.

The bowels are often relieved spontaneously a few hours the reduction of the hernia; but when they are obstinatel active, the question arises of the necessity of giving ape medicines. We have embraced abundant opportunities of c paring the advantages to be gained by the use of purgat and by abstaining entirely from their employment. We the preference to the latter plan, but if the lower bowel bec loaded, and any discomfort arises from accumulations the an enema of warm water, or gruel with common salt or a castor-oil, or even sweet-oil, mixed with it, produces the de result. Cases under our treatment have progressed favour and even the wound has healed, before the bowels have relieved, and not the slightest trace of inconvenience occu from the constipation.

When there is much tenderness on slight pressure upon abdomen, in the neighbourhood of the wound, the local appl tion of leeches is of great service, and it may be repeate often as required, but in relation to the powers and conditio the patient.

If acute peritonitis be developed, the treatment must b accordance with the ordinary rules for the treatment of disease.

Stimulants are often required soon after the operation, should be given in small quantities. Indeed it is a rule w requires to be enforced, that all aliment must be given in small quantities, and repeated at short intervals.

If thirst be distressing, pieces of ice placed in the mouth a great comfort.

Treatment of the wound.—The structures which have been and disturbed by the cutting operation should be placed in relation to each other, and the divided edges of the integuments brought together by sutures. The number required may be left to the discretion of the operator, but no more need be used than sufficient to keep the upper two-thirds of the wound united. For it is always advantageous to leave an opening at the lowest end to allow of the escape of blood and discharges. A piece of wetted or dry lint may be laid over the incision, and a pad of folded lint is adjusted over it with a bandage by some surgeons. However, a bandage is not required in every case, nor is it on any account essential.

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* *Guy's Hospital Reports*, 1842, vol. vii. p. 263.

If, during the subsequent progress of the case, the connective tissue in the wound, the omentum, or the hernial sac should inflame, the appearance of the integument soon betokens that union by adhesion is hopeless. In that case the lowermost sutures, or all of them, must be removed, and the treatment to be adopted need not differ from that commonly employed in every inflamed, suppurating, or sloughing wound. The grand point is to keep a channel open for the free escape of the discharges.

The prognosis of a case of strangulated hernia.—Reflection upon the facts already described will enable the surgeon to form a very nearly accurate prognosis of a case of strangulated hernia. But in order to concentrate the attention of surgeons upon those incidents which more especially cause a fatal termination, we must briefly recapitulate the most important morbid conditions which call for special observation.

1. The condition of the tissues of the herniated viscera, and especially of the intestine. Their morbid state is too frequently produced by violence in the use of the taxis, by long-continued constriction, or very tight strangulation of short duration. In such cases, then, the prognosis is usually unfavourable on account of the destruction of the portion of the bowel injured, or of its inability to repair the damage inflicted upon it.

2. The morbid state of the peritonæum, visceral and parietal, and of the tissues of that portion of the track of the alimentary canal between the stomach and the hernia. The existence of peritonitis antecedent to the liberation of the bowel cannot be regarded in any other light than a symptom of grave significance. Associated with it, the alimentary canal above the hernia is usually greatly distended, and its contractile fibres

appear to lose their function. The
unfavourable prospects, and lessen
very marked degree.

3. The impaired functions of the
tients sink away in the stage of pr
of the nervous system is induced
starvation, pain, suffering, exposur
gative medicines, some medicated
bath in some instances, and other
tate the reduction of the hernia
prostration, therefore, precedes the
must be regarded as a most unfavo

4. Neither should we overlook th
of the viscera of the thorax and a
hernia, so commonly existing in th
into our hospitals. Over the infl
however, we can exert but little
an important element in prognostic

5. All these conditions are also i
patient, social habits, general cac
syncrasies—features in a case to w
given.

Now the lesson that we learn fro
states which bring about a fatal ter
the herniated viscus into the abdo
to accomplish this with the utmo
consistent with the requirements
carefully between those cases in wh
in liberating the bowel without the
in which some means are justifia
taxis. By acting thus energeticall
remaining at the bed-side of the pa
the case until the risk of danger
intestine, the surgeon may hope t
large majority of the cases of stran

The high mortality arising from
opprobrium upon the medical art w
any amount of skill or dexterity
surgeon. The risk of the operation
ance, and the subsequent treatment
condary considerations when comp
which the patient is subjected befor

to perform his part. All matters relating to the operation only have, perhaps, reached perfection; but it would really appear, from the condition in which patients are sent into the hospitals to be operated upon, that the greatest amount of ignorance prevails of the principles upon which an irreducible hernia should be treated.*

PART II.

SPECIAL KINDS OF HERNIA.

The following classification of abdominal ruptures is arranged with regard to the anatomical divisions of the abdomen in which they appear:

I. In the EPIGASTRIUM	1. Diaphragmatic. 2. Epigastric.
II. In the MESOGASTRIUM	1. Ventral (also in other regions). 2. Umbilical. 3. Lumbar.

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* Twenty patients who died after the operation had been performed by the author in Guy's Hospital survived the operation as follows:

1 only 17 hours.
5 survived 24 hours and less than 48 hours.
4 „ 48 „ „ 72 „
1 „ 72 „ „ 96 „
1 „ 96 „ „ 120 „
3 „ 144 „ „ 168 „
1 „ 168 „ „ 192 „
3 survived longer periods, but with artificial anus.
1 died of bronchitis.

The causes of death were—

Artificial anus, &c., in . .	3	Perforation of bowel in . .	1
Prostration in	5	Bronchitis and cachexia in .	2
Acute peritonitis in . . .	8	Neglect to seek surgical aid in	1

There can be little doubt that the lives of at least two-thirds of these patients were sacrificed by the delay in having recourse to the operation for the liberation of the bowel; which, however, was performed as soon as possible after admission.

A

B

C

III. In the HYPOGASTRIUM

HERNIÆ IN THE E

Diaphragmatic hernia.—Of the
first, that in which the diaphrag
consequence of a loss of tone, an
cavity by the contents of the ab
in consequence of congenital d
through the aperture into th
some of the abdominal viscer
the natural apertures in the
stretched.

Epigastric hernia escapes in t
lages of the first false ribs, the
appendix of the xiphoid cartilag
infant with a tumour in this
time any effort was made with
sac of this hernia is generally
umbilical, and the mouth throu
usually large. The reduction
easily effected. A suitable ban
escape of the hernia, which son
the stomach, or arch of the colc

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* Exclusive of cases in which the
through a laceration in the diaphrag
INJURIES OF THE ABDOMEN, Vol. II. p

HERNIA IN THE MESOGASTRIC REGION.

'entral hernia.—Of this hernia there are two kinds: first, e which occur in the linea alba; and, secondly, those which through other parts of the parietes, except the so-called 's.

hose of the first kind usually escape in the linea alba between umbilicus and the pubes. They are produced as the con- ience of general relaxation and stretching of the fibrous ie in the middle line of the abdominal walls after they have greatly distended during pregnancy or ascites. We have hernia consecutive to an abscess in which the pus had made vay through at the linea alba. This kind of hernia is more mon than the second, which escapes through any part of anterior or lateral walls.

he usual indications of a rupture accompany these kinds ; the chief risk of an error of diagnosis arises where cir- scribed collections of pus exist in the parietes without h local pain or any constitutional disturbance. If the ia be reducible, the surgeon would not be likely to fall error; and if not, the history of the case, with a careful ipulative examination, will enable him to form an accurate nosis.

mbilical hernia.—By this term we understand that kind of ure which escapes from the abdominal cavity, either through umbilical ring in the fœtus, or by an aperture formed at a period of life in consequence of a separation of the fibres ie linea alba in the umbilical region. (See Fig. 272, p. 766, hich a small one is delineated.)

he synonyms are, exomphalos, omphalocele, or, in common uage, ruptured navel.

is developed at all periods of life, and in both sexes. Most monly observed in infancy, it forms a protrusion either re or soon after the separation of the umbilical cord. In h it is rarely developed, provided that the umbilical aper- has been once well closed. As years advance, it is more uent, especially in females, and particularly so in persons osed to obesity.

'he hernial sac is always an acquired formation in this rup- ; that is to say, there is not any peritoneal extension at the umbilical ring, in fœtal life, analogous to the inguinal vagin process of the peritonæum. Nevertheless, writers have bee long accustomed to divide this hernia into the congenital variet or that which is so common in infants; and the acquired, that variety which is developed in after-life.

In infants the protruding viscus pushes before it that porti of the parietal peritonæum lying immediately behind the apertu in the linea alba, through which the umbilical vessels enter t abdominal cavity. The hernial sac is thus formed before t closure of the ring is effected, and may pass into the connecti tissue of the cord itself, before that structure has separat We have seen such a case in which the integuments coveri the sac sloughed. Rather later, after the separation of the co the hernial sac may be protruded in consequence of the um lical aperture remaining imperfectly closed when it is cover only by the integuments. In youth, a rupture may be develop by escaping through a partially closed ring, which, by continu pressure, it dilates, unless precautions be taken to prevent And, in adult life, the fibres of the linea alba become separat by stretching or yielding to the pressure from within, and t rupture escapes at the site of the once closed ring, or in immediate vicinity. The coverings of the hernial sac are gen rally very thin, and often inseparably united together. Th consist of the integuments; some fat, which, however, is n often in proportion to the thickness of the layer over the oth regions of the abdomen; and the delicate internal abdomin fascia. The body of the sac is usually very delicate, but it rather stronger near and at its orifice, around which part t tissues outside of it form a very firm, resisting, unyielding ban The mouth of the sac is often large in proportion to the bulk the protrusion. The relation which it bears to the tumo when the protrusion is large should be carefully studied. the bulk of the hernia increases, it does not spread equa around the ventral aperture upon the anterior surface of t abdominal walls, but it descends towards the symphysis pu more than in any other direction. In some cases it happe that the transverse diameter of the tumour is greater than t vertical; and occasionally its configuration is so pyriform th the tumour seems to be suspended by a peduncle or stalk. other times its base is nearly as large as its body; and, ag we may see an almost sessile tumour which, when elevated, attached by a small stalk, thus resembling a mushroom in sha

Various organs of the abdomen are found in the sac of an umbilical hernia; very frequently the omentum, the stomach,* portions of the small intestines and of the large. When the disease has been neglected, we have seen nearly the whole of the intestinal canal in the sac enveloped by omentum. The last-mentioned organ sometimes becomes firmly united to the sac; and when bands or septa are thus produced within it, the intestines may become entangled by them. The omentum likewise becomes hard and contracted, forming masses within the sac which sometimes give rise to difficulty in diagnosis.

This rupture begins by forming a small soft projecting ovoid tumour at the navel. Gentle pressure with the finger pushes something into the abdomen, and a small hole is then felt, with very sharp, rigid edges. Directly the finger is removed, the skin either remains relaxed or flabby in the fossa of the navel, or it is slowly projected forwards, and reappears in the same bold relief. If the progress of the disease be not arrested, the protruding viscus descends lower and lower, so that the broadest part of the tumour lies below the mouth of the sac. A curious example of congenital umbilical hernia, coupled with malformation, was shown by Dr. Gibb at the Pathological Society, and in the same volume of the *Transactions* there is a description of a case of triple umbilical hernia which contained portions of the stomach, duodenum, jejunum, ileum, omentum, and ductus communis choledochus.†

Treatment when reducible.—Should there be any disposition to a protrusion at birth, or soon after, the simple application of a bandage is not merely palliative, but materially tends to the cure of the case. In infancy, after the separation of the cord, the protrusion may be prevented by fixing a piece of cork over the umbilical ring. It should be circular, about one inch in diameter, slightly convex on both surfaces, and covered with soft leather. With adhesive plaster to retain it in its proper place, and a bandage encircling the abdomen but not violently compressing it, this plan is sure to be attended with advantage. In the majority of cases the complaint will be cured. When the protrusion occurs in an adult, a suitable truss or bandage must be employed, with a view to prevent the dilatation of the

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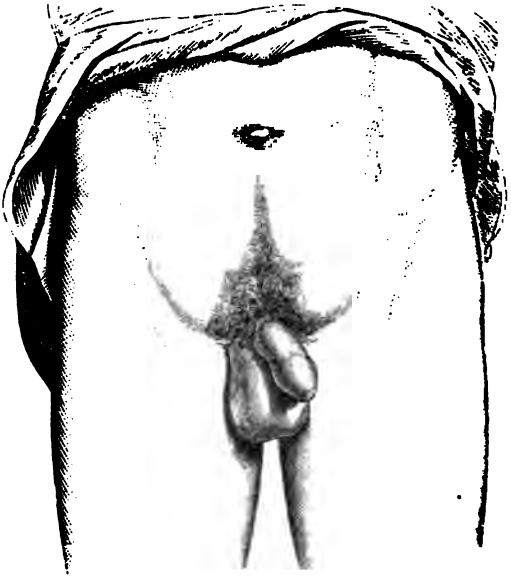
* A very interesting case is related by Mr. Moore, in the *Med.-Chir. Trans.* vol. xlvi. p. 181.

† *Trans. of the Pathological Society of London*, vol. vii. pp. 216, 220.

Of inguinal hernia the following varieties are described: th oblique or external, and the direct or internal. The term external and internal have reference to the course taken by th internal epigastric artery in relation to the orifice of th hernial sac. In the oblique kind, the mouth of the sac i situated to the outer or external side of this artery; in th direct, this important part of the sac is placed to the inner sid of the same vessel.

There are also varieties of the oblique kind named accordin to the situation of the protrusion; thus the tumour is called

FIG. 268.



The annexed woodcut represents double inguinal hernia. On the man's right sid the protrusion has passed through the inguinal canal, and is just entering th scrotum. On the left side it is called 'bubonocele.' The outline of Poupart's ligament, below the swelling produced by the protrusion, is distinct.

'bubonocele,' when the hernia has passed the internal inguinal ring, but has not protruded at the external, when, in fact, it is retained in any part of the inguinal canal. It is called 'scrotal hernia or oscheocele,' when it has passed through the external abdominal ring, and is therefore in the scrotum.

We propose the following anatomical classification of the varieties of oblique inguinal hernia.

1. Into the vaginal process of the peritonæum (the congenital hernia of Haller, and subsequent writers).

2. Into the funicular portion of the vaginal process of the peritonæum.

3. Scrotal, the sac being thrust into the tissues of the crotum.

Of inguinal hernia in the male.—This species escapes from the bdomen, *above* Poupart's ligament, through the internal and xternal inguinal apertures or abdominal rings. There are two arieties, the *oblique* and the *direct*.

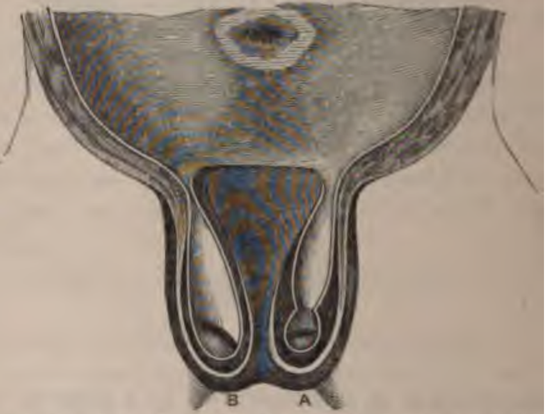
Oblique inguinal hernia, having passed through the internal nguinal ring, lies in the inguinal canal. Pursuing the oblique irection of this canal, it emerges at the external inguinal ring, nd enters the scrotum, into which it descends. The mouth of he hernial sac is situated to the outer side of the internal pigastric artery, whilst its neck and body are usually in front f the structures composing the spermatic cord. But in rare ases these organs are divided; sometimes the blood-vessels ass over the tumour, the vas deferens behind it, and *vice versâ*; r they are attached to the sides of the tumour. The relative ositions of the hernial tumour and testicle differ. The variable ite of this organ depends upon congenital defect, and hence in ome cases the testis cannot be distinguished from the tumour roduced by the hernia. However, in the majority of cases the esticle is situated at the posterior and inferior region of the scrotum; more rarely, it may be detected at the front of the fundus of the tumour. An endeavour should always be made to ascertain the site of this organ, in every case of inguinal hernia, and under all circumstances.

The coverings of the sac of an oblique inguinal hernia are formed by the tissues of the region in which it lies. To expose the sac of a bubonocele, it is necessary to divide the integuments of the groin, the aponeurosis of the external abdominal oblique muscle, and the internal spermatic fascia. Some of the fibres of the free edges of the internal oblique and transversalis muscles are observable along its upper border, and some fibres of the cremaster muscle skirt its lower edge. To reach the sac of a scrotal hernia, we must divide the integuments of the scrotum, including the dartos, the fibres of the cremaster muscle, often strongly developed, and the internal spermatic fascia. This last-named fascia is the delicate membranous extension of the internal abdominal fascia along the spermatic cord.

The mode of development of the sac of an oblique inguinal process of the peritonæum, into the inferior testicula process; and the superior funicular vaginal process, at t end of which a communication with the abdomen re on the other side.

This imperfection is delineated by Camper. In *Icones Herniarum*, folio, 1801, plate x., he contrast that one represented in fig. 269, A. The drawing was the dissection of an infant, in 1759. Seiler also give to illustrate a rather more contracted state of this p vaginal process, in a work entitled *Obs. de Testiculorun mine in scrotum descensu*, &c. More recently, M. has described the frequency of hernia in association imperfection, *Leçons clin. sur les Hernies*, Paris, 1841 *L'Union médicale*, 1854.

Fig. 270.



Examples of hernia into the funicular portion of the process of the peritonæum occur very commonly in child a preparation of a hernial sac, originating with this preserved in the Museum of the Royal College of Surge 1328.

Fig. 270, B. In this diagram the vaginal process is rep as a tube passing down in front of the spermatic cord a The ventral orifice has been closed above.

This is the condition of the vaginal process of the per described by Mr. Hey, in which he 'found that th vaginalis was continued up to the abdominal ring.'— *Obs. in Surgery*, 3rd edit. 8vo, 1814, p. 227.

I suspect that it is this imperfection of which prep exist in museums, described as 'a congenital hernial he mouth obliterated,' when unaccompanied with a history hat the man from whom it was removed had ever been rupured.

Associated with congenital persistence of the vaginal proess of the peritonæum, the testicle of the same side as that on hich the defect occurs frequently occupies an abnormal situaion.

When in its normal site at the lower part of the scrotum, it annot always be distinguished from the hernial protrusion hich occupies the same serous sac as this organ and overlies t. But although this region should contain a hernial tumour, he testis may not have reached the scrotum at all.

The situations in which it is then found are as follows:

1. Within the abdomen; the vaginal process extending into he inguinal canal, but not reaching further than just through he external abdominal ring, or into the upper part of the crotum.

2. Fixed in the inguinal canal out of the reach of manipulaion; whilst the serous canal, passing into the scrotum, forms sac for the reception of a hernia.

3. Immediately outside the external abdominal ring at the pper part of the scrotum; in which state, when a hernia escends, it passes in front of this organ into the scrotum, even s low as its fundus.

A defective development of one or even both sides of the crotum is associated with the cases of deformity above described hich may lead the surgeon to discover an abnormal position f the testis; a fact of great importance in the treatment of hese cases of hernia.

abular view of the abnormal conditions of the vaginal process of the peritonæum, deviations from the normal situation of the testis, and the relative position of the hernia.

Hernia into the vaginal process of the peritonæum:

1. The vaginal process continuing open and common to the ord and testis. (Fig. 269, A.)

The testis may be situated—

a, in its normal site at the fundus of the scrotum;
b, just outside the external abdominal ring, or between its pillars;
c, within the inguinal canal;
d, within the abdomen.

(Fig. 269, B.)

The testis in the scrotum.

N.B. The hernia is never in contact wit

APPENDIX.—*Additional sacs, or prolongation*
the vaginal process within the abdom

Concurrent with these instances of malpla
of those complicated cases of hernia which
in the configuration and anatomical disposi
sac. In a majority of the cases in which the
any very unusual direction, the hernia is fo
same sheath as the testis, or a portion
sufficient proof of the precise nature of the
cause of its development, if any be required.
recorded in which a sort of second sac or offs
process of the peritonæum extended betw
composing the abdominal walls. Hence
parietal,' 'ascending, or intermuscular,' and
been applied to this variety of hernial sac.
this category are the cases termed 'hernie e
writers. These cases form two classes:

1st. Those in which the sac extends int
dominal walls.

2nd. Those in which it extends into the i

In the first class, the sac extends upward oneurosis of the external abdominal oblique muscle, lying ween it and the integuments; and when the hernia pro-udes, it forms a tumour in the groin above and parallel with upart's ligament. An example of this rare variety is oted by Scarpa,* and another case has been recorded by . Fano.†

In the second class, the sac extends into the iliac fossa and ts upon the iliacus muscle, between the internal abdominal cia and peritonæum; or directing itself inwards, it passes hind the horizontal ramus of the pubes, and reaches the side d front of the urinary bladder.‡

Hernia into the funicular portion of the vaginal process of the itonæum.—When the surgeons of the last century discovered t a hernia could pass into the vaginal process of the peri-æum, and there be in contact with the testicle, they appear have been content with this fact, and, without further earch, to have assumed this variety to be the only form of nia dependent for its origin upon non-closure of the ventral fice of this canal, or defective obliteration of the upper part the vaginal process of the peritonæum. Thus many writers nowledge the fact that an infant may be the subject of crotal hernia, and, after detailing such a case, they add, t not congenital;' implying by that expression simply the tomical fact that the hernia is in a distinct sac, and thereby arated from the testis, in the same manner as it occurs in adult. The term suggested in this essay precludes an oneous view of those varieties of hernia which originate in genital defect of the coverings of the testis and spermatic d, and renders the disease in the infant and in youth much re easy of comprehension.

The reader should recall to mind the previous statements re-ting to the descent of the testicle, and the development of the nica vaginalis propria testis out of the inferior termination of e vaginal process of the peritonæum. For surely there cannot a tunica vaginalis propria testis developed so long as a canal ists along which a hernia may descend and touch the testis.

Treatise on Hernia, translated by Wishart, 1814, 8vo, p. 171.

L'Union médicale, December 1861.

Cases by Dr. Parise, in *Mém. de la Soc. de Chir. de Paris*, 1851; *Mém. sur variétés nouvelles de Hernies.*

canal thus becomes converted into a hern
'congenital,' too, as the variety ordinaril
term, for it is dependent upon a congenit
closure of the abdominal orifice of the c
tion in front of the spermatic cord as fa
vaginal sheath. This variety is now di
into the funicular portion of the vagina
tonæum.

In the new-born infant, or at a later
months after birth, it is not at all un
with a hernial protrusion occupying th
scrotum, but entirely separated from the te
situated, at the fundus of the scrotum.

M. Malgaigne was, I believe, the fi
this variety of hernia, and to point out
relations, and distinctive features. It is
Carefully instituted examinations lead us
nearly as frequently met with as the
described; but, from the fact of its havin
the scrotal hernia of the adult, very littl
bestowed upon it. The diminutive size
led to its relative situation, as regards th
overlooked and neglected; for cases whi
examined have generally been regarded a
termed 'congenital,' and not worthy of
In the earlier periods of life, the distinct

velopment: either that the parietal peritoneum of the domen was suddenly pushed downwards before the hernia to rm its sac; or that a serous canal existed continuous with e peritoneal cavity, which became converted into the hernial c. The last explanation, being strictly in accordance with atomical facts, appears to me to be the one which the morbid atomist will adopt.

The congenital patulence of the funicular portion only of e vaginal process of the peritonæum is capable of proof by atomical examination, and there is no more reason to question remaining so during the later periods of life, than to dispute e fact of the occasional unobliterated state of the entire gth of the vaginal process to the fundus of the scrotum in ult life. We are able to adduce abundant facts to prove the velopment of hernia in such cases, if space permitted.

In advancing adult life the orifice of the hernial sac still aintains its original relations to the internal abdominal ring, nd especially its depth. Under these circumstances, a hernia aving existed many years, the abdominal rings are not proximated, but remain widely separated. A man, forty-five ars old, was operated upon by myself on account of strangu-ted oblique inguino-scrotal hernia, with which he had been licted since boyhood. This was the first time he had found y difficulty in returning the protrusion. The orifice and neck the sac were deeply seated; that is, the index finger was ssed along the inguinal canal to reach the abdominal orifice the sac. It did not require division, but was sufficiently ge to allow of the reduction of the hernia after the sac had n opened and a large quantity of serum had escaped. His e terminated successfully. The testis was at the fundus the scrotum, and separated from the contents of the hernial .

The next question relates to the frequency of these varieties hernia into the vaginal process of the peritonæum.

After making inquiry of patients afflicted with inguino-scrotal rnia for many years, we were much surprised to find that so any of them stated that the protrusion occurred suddenly, and as first observed when the dimensions of the scrotum were in-eased by the presence of the hernia. Another circumstance lso attracted attention. Robust, healthy, and well-developed en, of middle age, asserted that the rupture first descended when they were about twenty years old—a circumstance no specially alluded to; but it appears to be a very common rence. When discussing this matter with friends, and this fact, they have suggested that working-men might very accurate in their statements, and that, being hal thoughtless of their persons, no dependence could be upon their assertions. This objection has had its d sideration and weight in our inquiries, and we have, th only referred to recent cases, or accepted the accounts by those patients who seem to possess a fair average inte and might be presumed to give reliable information con the subject of inquiry. During the two years 1859 an forty-four patients, suffering more or less from inguinal were admitted into the wards of Guy's Hospital. Amon were twenty-six cases of hernia into the vaginal process peritonæum; and of these, twelve had the testis and he contact (the hernia congenita of Haller), whilst in the r ing fourteen the hernia occupied the funicular portion canal, and was separate from the testis. In several p the hernia was developed suddenly, and reached the scro once, the first time it was observed, even in adult life, t being robust and well-developed. The respective ages patients, at the time they came under examination, between fourteen months and forty-seven years.

Pott wrote, nearly a hundred years since: 'Ruptures at with that particular circumstance which brings them und description mentioned in the title, are said to be very rar from what I have observed, both in the living and in the I am inclined to believe that they happen much ofte adults than they are suspected to do.'*

To demonstrate, perhaps even more satisfactorily, large proportion of the cases of inguinal hernia is dev at a very early period of life, we may refer to the Reports City of London Truss Society, so industriously drawn Mr. Kingdon.

The total number of males applying at the Society the years 1860 and 1861, whose ages were ascertained time the hernia was first observed, amounted to 7,543; of

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* *An Account of a particular kind of Rupture, &c., viz. that in w Intestine or Omentum is found in the same cavity and in contact with the* by P. Pott, Lond. 1765, 2nd edit. p. 5.

63, or 383 more than half, had reached only thirty years of . Thus it appears certain that inguinal hernia is developed y frequently before thirty years of age.

'his statement, which may be accepted as correct, is fully ported by reference to the table I have arranged from the ɔort of the City of London Truss Society (see Table, p. 645). this it appears that inguinal hernia occurs very frequently ing the first twelve months after birth. This happens in sequence of the congenital persistence of the canal of the inal process of the peritoneum. Its frequency then diminːs to puberty, after which period the cases rapidly increase he completion of thirty years of age.

'aking periods of ten years, or decades, the frequency of uinal hernia at different ages is well seen (see Table, p. 731). is remarkable that the first decade contains the largest ıber of cases, and next the third or that between twenty thirty years of age. From this period of life the cases ːease in a rapid ratio.

'our-glass-shaped contraction of the sac of oblique inguinal ia.—An uncommon peculiarity in the conformation of the sac lf of an oblique inguinal hernia occurs in consequence of a ːowing of its walls at a point corresponding with the site of external abdominal ring, or a little below that point in the tum between the testis and that aperture. When a hernia the sac, it may become strangulated by this constriction. outline of the hernial tumour, as well as that of the sac, ːtly resembles the shape of the ordinary hour-glass; hence name given to it. It is always associated with a congenitally ı state of the vaginal process of the peritoneum. The lt of the imperfect closure of this sheath at that part where n of its walls normally takes place, is to give rise to the ıation of a ring or circular constriction within this process he peritoneum at the point where the tunica vaginalis ɪria testis and tunica vaginalis propria funiculi meet together. ead of the upper division of this canal being closed, and two divisions, by this means, rendered distinct from each r, they communicate freely. The result is, that a hernia es through the abdominal orifice of the funicular portion he canal, traverses it, and then passes through the conːtion into the cavity of the tunica vaginalis propria testis, ːh gland it touches. Instances of this constricted conɔn of the sac of an oblique inguinal hernia are related by

Pott,* Wrisberg, Le Cat, Scarpa,† Pelletan, Sir A. Cooper, and
Mr. Lawrence.

Case. A labourer, twenty-nine years old, was brought into Guy's Hospit
in September 1858, in a state of great prostration, and having a rupture in t
left side of the scrotum. There had never been any tumour noticed un
seventy-eight hours before admission. All observers were struck with the sm
size of the neck of the tumour, its pear-shaped form, thus closely resembli
the outline of a hydrocele, and the seeming absence of the left testis. T
external abdominal ring was distinctly recognisable, and I could pass my fin
through it, but I could not make out distinctly the spermatic cord. On pal
tion a very audible gurgling sound was produced in that division of the swel
between the internal ring and the upper part of the scrotum, the integum
of which were red, tense, and shining. The whole tumour was divisible in
superior division and an inferior. This last, which was the largest, rema
unaltered by manipulation, was firm, and resisted pressure, although slig
elastic, and was very painful when compressed. The upper division was
and the swelling entirely disappeared when slight pressure was applied; bu
was reproduced by the contraction of the abdominal muscles, or by pressur
the abdomen above the internal ring. All the symptoms of strangul
intestine being strongly marked, and considering that the liberation of the he
was imperative, I administered chloroform; and finding, when the man
fully under its influence, that I was still unable to reduce the protrusio
determined to operate at once. An incision of the integuments, four in
long, was made, the direction of which was parallel with the long axis of
tumour, and the centre corresponded with the site of the external abdom
ring. This aperture, although seen, was not sharply defined. I could now
my finger upwards on the outside of the hernial sac to the internal ring,
trace its boundary. A very distinct constriction was now seen in the bo
the tumour, producing the form of an ordinary hour-glass. This constric
corresponded with the ramus of the pubes over which it crossed. I opened
superior division of the hernial sac above this constriction, and exposed hea
intestine only. I next endeavoured to extricate the bowel from the inf
division of the sac; but I was unable to release it. A grooved director
carefully introduced into the inferior sac, and much blood-tinged serum esc
along the groove. Still, even when all the serum had run out, and trac
was made on the bowel from above, it was inextricable! What chance
was there of reducing the bowel by the taxis? The constriction of th
having been divided, the strangulated bowel was easily returned into
abdominal cavity without any enlargement of its abdominal orifice b
required. The left testis was visible at the fundus of the sac—suffic
evidence that the hernia had descended into the vaginal process of the pe
næum. This man recovered.

Other cases of this kind have occurred in my practice. They are not, I sus
quite so uncommon as at first sight we might be led to assume. Out of f

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[*] *Chir. Works*, edit. 8vo, 1808, vol. ii. pp. 118, 184, case xiv.

[†] *A Treatise on Hernia*; translated by Wishart, 8vo, 1814, p. 138, p
fig. 2.

cases of oblique inguinal hernia, which Mr. Kingdon selected for me, in order to illustrate quite a different subject, I find that he observed the characteristic hour-glass constriction of the scrotal tumour in four men in whom the hernia was developed at the respective ages of seventeen, twenty-nine, and thirty years, and one in boyhood.

But what explanation can be given of the constriction of the bowel by the sac at such an unusual part? Let us seek for it by an examination of preparations and a reference to the physiological changes taking place in the vaginal process of the peritonæum before, or soon after, birth. Before doing this, let us distinctly isolate and exclude from the class of cases about which we are writing all those in which the impediment to the reduction of the hernia, or the cause of constriction of the bowel, depends upon the development of adventitious bands crossing the cavity of the sac without any definite or specific arrangement. Hernial sacs, showing such peculiarities as last mentioned, are preserved in the London museums; but they are quite foreign to our immediate purpose, and belong to a perfectly distinct category as regards their development and relations to the sac and its contents.

In the cases we are now describing the hernial protrusion and testis are in contact, otherwise the case would not belong to this class.

In the Museum of the Royal College of Surgeons there is a Hunterian preparation, No. 1343, thus described in the catalogue: 'The sac of a large congenital hernia. The exterior of the sac is uneven and sacculated, through the unequal yielding of different parts of its walls: the testicle is situated at the lowest part.' This account is not sufficiently explicit or descriptive of the structure of the hernial sac and its relations to the testis. A careful examination of the interior of the sac shows a large superior division and a small inferior. In the latter the testis may be recognised; but between the divisions an imperfect septum, or perforated diaphragm, existed before the vertical section of the entire sac was made, and by means of this foramen a communication was established between them. The sharp, well-defined, free edges of this septum are seen stretching from the sac-wall to the testis, as well as its strong attachment to the sac itself. Now assume the cut edges of this sac to be joined together, and the superior and inferior sacculi would be complete, although any foreign body might be passed from the one into the other. A hernia, for example, filling the upper sacculus, might pass from it through the aperture in the diaphragm into the lower, and then become constricted by the margins of this annular contraction.

But a preparation in the Museum at Guy's Hospital, No. 2368, at once affords a satisfactory clue to the solution of these somewhat remarkable cases. It is the vaginal process of the peritonæum taken from a child. It shows a portion of the parietal peritonæum of the abdomen with the whole process extending downwards from it. This process has been opened along the whole extent of its anterior surface. At the superior extremity the canal communicated with the abdomen, and at the inferior extremity the testis may be seen; and between these two points, about midway, the cavity is contracted. When this tube was uncut, there must have been an opening or narrow passage near its centre, through which a protrusion, coming by the abdominal orifice, and traversing the funicular portion of the vaginal process, must have passed to reach the testis. A constriction resembling this formed the impediment to the reduction of the hernia in the cases above described.

Sir Charles Bell describes a hernial sac of this kind which came under hi observation in connection with an obscure case of hernia, which he has record in the *London Medical Gazette* of 1828.[*] 'There was another remarkable ci cumstance observed, which related to the sac lodged in the scrotum. At t lowest part there was a hole of communication between that sac and the cavi which is between the coats of the testicle. This orifice was so large that t finger could be passed through it; and its margins were so dense as to re dilatation.' In the explanation of the woodcut, he writes: 'A bougie been passed from the hernial sac into the cavity formed by the tunics of testicle, through an opening which forms a communication between them.'

A careful examination of the second figure of the 2nd plate of Key's edi of Sir Astley Cooper's work on Hernia will satisfy any one that it deline a case of the kind we are describing. It was a 'congenital hernia firmly stricted by an annular contraction of the sac itself,' although described band of membrane adhering to the sides of the tunica vaginalis, *throug aperture in which* the intestine has protruded and become strangulated.' hernia is seen both above and below this aperture; the portion below ' coloured by the effects of strangulation' produced by its margins; the tion above, 'below the internal ring and above the strangulating band, from pressure and retaining its natural appearance.' Now in this descrip we have but a repetition of the appearances I observed in the case u my own treatment, related at p. 744. In chap. xvii. on *Congenital He* Sir Astley Cooper states that in this variety 'the stricture is much oft found to be *within the sac*, than in the ordinary kinds of hernia;' and relates a case, upon the authority of Mr. Hodgson, of Lewes, in which intestine 'was found strangulated within an aperture of the tunica vagin The intestine appeared to have suffered more from this stricture than the ring.'

Lastly, Mr. Lawrence,[†] when describing cases of this kind, records on which, 'about half-way between the testis and groin, the hernial sac wa contracted that a probe only would pass into the stricture.' In this case, the abdominal orifice of the sac 'would not admit the smallest portion of tip of the finger,' and it also formed an impediment to the reduction of hernia; in this respect differing from my case.

By these quotations, to which numerous instances might added, especially those recorded by Mr. Pott, with dissectio case 14,[‡] it is capable of demonstration that this class of ca must be confined to those forms of inguinal hernia depend upon congenital defect or persistence of the vaginal process the peritonæum throughout life.

But a glance at a plate in Camper's work[§] will more eas explain the nature of these cases. Figure 2 shows the cavi of the right vaginal process of the peritonæum opened vertica from the abdomen to its inferior termination; at which point is seen the testis. Figure 3 shows the left side, in which, just above the testis, the entire canal is divided into two portions by the internal surfaces of the serous membrane united together. Should it, however, happen that this septum is not complete, a mere contraction takes place, and a ring is thus formed, keeping up a communication between the persistent funicular portion of the vaginal process, which is above, and the cavity of the imperfect tunica vaginalis testis below. By the constant pressure around a hernia, the tissues composing this annular contraction of the hernial sac become more and more dense, until it forms a firm, fibrous, callous ring at the situation where the tunica vaginalis ordinarily terminates just above the testis; its variable distance from that gland depending, in different cases, upon the larger or smaller size of the protrusion, and the consequent distension of the tunica vaginalis testis.

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[*] Vol. i. p. 484; also a woodcut.

[†] *On Ruptures*, 5th edit. p. 574.

[‡] His *Chirurgical Works*, edit. 1808, vol. ii. p. 184.

[§] *Icones Herniarum*, tab. x. 1801.

The differential diagnosis between these cases, of hernia into the vaginal process of the peritonæum, and the ordinary form of inguino-scrotal hernia, is formed by the manner of their development, the age at which they first appear, and their configuration. Whilst the common form is developed slowly, these appear suddenly, and often pass at once into the scrotum without resting in the inguinal canal. They are noticed in the earliest infancy, throughout childhood, and during early adult life. Their form or outline is highly characteristic. The tumour projects in a remarkable manner from the external outlet of the inguinal canal; directly the rupture escapes from the embrace of the external abdominal ring, the form is more globular and rounded in comparison with the pyriform outline of the hernia of slow formation in adult life. The testis can or cannot be felt; when it is easily detected, it is evident that the gland and rupture are in separate sacs, and *vice versâ*.

In the hour-glass-shaped variety the configuration alone is sufficient to attract notice and lead to its diagnostication.

When the hernia is reducible, the depth of the internal abdominal ring and the length of the inguinal canal are discoverable by tactile examination.

The importance of recognising these cases.—It is highly important to recognise the cases of hernia into the vaginal process of the peritonæum, in a practical point of view, especially in relation to their treatment. Much more severe constitutional symptoms usually accompany strangulation in these cases, and this condition of the hernia takes place more rapidly than when t hernial sac has been of slow formation. They require, therefo the liberation of the bowel as soon as it is possible.

Considerable difficulty is experienced in reducing these p trusions by the taxis, in consequence of the depth of the ori of the sac, the inability of the operator to fix it or command movements, the contraction of its orifice, its unyielding textu and the length of the neck of the sac, or that part of it l between the two inguinal rings within the inguinal canal. cases of the hour-glass contraction of the sac, the tax generally useless if the bowel has been strangulated but a hours, and persistence in such attempts is extremely hazard Under any conditions, the surgeon must remember that two tinct and separate contractions exist, through which the rup must have passed; one of these being situated in the body o sac, the other being its true ventral orifice. Either of these tractions, or both of them, may offer insuperable impedim to the reduction of the hernia, unless their tissues be cut.

If we scrutinise any large number of cases of inguinal he admitted into the hospitals, a majority of those requiring liberation of the bowel by a cutting operation are patients u 30 years of age. At St. George's Hospital, out of 28 m suffering with strangulated oblique hernia, 17 were unde years of age; 11 had passed that age.* At Guy's Hospita 57 cutting operations performed in order to liberate a stran lated inguinal hernia, 33 belonged to the class of which we writing, 24 were of the old slowly-forming variety. Nex order to demonstrate with how much greater facility the inguino-scrotal hernia is reduced by the taxis, than descending into the vaginal process of the peritonæum, we refer to 129 cases of oblique inguinal hernia, admitted also Guy's Hospital. Of these, 59 had traversed the canal of vaginal process of the peritonæum, 70 belonged to the inguino-scrotal variety. Or, tabulated thus:

Of inguino-scrotal, the sac of which formed slowly	94 cases	requiring a cutting operation . . .	24 or 25·53 per ce
		reduced by taxis . .	70 ,, 74·46 ,,
Of ing.-scrotal descending along the vaginal process of peritonæum	92 cases	requiring a cutting operation . . .	33 or 35·86 per ce
		reduced by taxis . .	59 ,, 63·04 ,,

Another subject of great importance relates to the applicat f the taxis. In some of those cases in which the hernia, when rangulated by the orifice of the sac, was supposed to have een returned into the abdomen in a mass, more careful exami- ation after death showed that the inguinal portion of the sac as burst, and that the bowel had been pushed through the ceration, and was lying outside the peritonæum, between it nd the internal abdominal fascia. This accident is more fully escribed at page 704. In these cases, also, the mouth of the c is sometimes detached from its connections. When the tient is youthful, and the anæsthetic effects of chloroform are lly produced, great caution is, therefore, necessary in using e taxis, on account of the slight and delicate connections the peritonæum to the neighbouring parts at this early age.

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* *Medical Times and Gazette*, 1861, vol. i. p. 624.

Difficulties also attend the operations on these cases, in con- quence of the depth of the orifice of the sac, the variable position the testis, and the varieties which may be encountered in e disposition of the hernial sac, all of which have been before scribed.

Infantile hernia.—The infantile hernia of Hey, and the cysted hernia of the tunica vaginalis of Astley Cooper, are nonymous terms for a variety of the oblique inguinal hernia, pending likewise upon an abnormal condition of the tunica ginalis peritonei. The state of that sheath which precedes e development of this kind of hernia depends upon the ventral ifice being closed, but the canal persisting from that point to e testis. The hernia slowly pushes before it the parietal ritonæum of the abdomen into this sheath, and when the parts e dissected, it is seen that 'the tunica vaginalis is continued to the abdominal ring, and encloses the hernial sac,' as Mr. ey describes. In this manner 'the protruded parts, together ith the sac, are contained in the tunica vaginalis testis' awrence, *A Treatise on Ruptures*, p. 576).

The name given by Hey to this variety of hernia leads the ader to infer that it is always developed in infancy. This, owever, is not the fact. Hey's case was an infant fifteen onths old. Forster's case, related by Cooper, was thirty-one ears old at the time of the operation. The duration of the pture is not specially stated, but the description induces us to elieve that it had not existed long. In Lucas's case the pture was developed at about seventeen years of age. The an in Forster's second case had been ruptured all his life.

Mr. Holmes reports a case in which the rupture was develope
about twelve years of age ; and I operated upon a man in G
Hospital, forty-two years old, who was not ruptured unti
had completed his thirty-fifth year.

Cases of this kind are very rare. Their precise natur
usually only detected during the time of the operation, v
the surgeon finds that on cutting into the tumour, a se
cavity is opened, which contains the hernial sac, invested
ternally by a serous membrane. Within this, the true he
sac, the rupture is found. The operator may also be a
puzzled by finding the tumour so remarkably movable,
he has incised the first serous sac. The whole tumour,
the testis attached to its walls, falls out, and seems to be
suspended by its attachment to the margins of the ext
abdominal ring.

Inguino-scrotal hernia of slow formation.—That variet
oblique inguino-scrotal hernia which occurs in middle
late adult life, and forms for itself its own sac by pushing
parietal peritonæum before it, causes at first a slight swe
at the internal abdominal ring, slowly traverses the ing
canal, and at last occupies more or less of the scrotum.
the 'pointing' of the hernia at the internal inguinal rin
M. Malgaigne aptly terms it, the attention of the surge
sometimes drawn. Upon inspection a slight elevation o
integuments over the internal inguinal ring is observable, w
becomes more prominent when the patient contracts the a
minal muscles or coughs, especially if standing erect. In
posture, and under similar influences, if the finger be pl
over the ring, the hernia is projected against it, and the se
tion thus induced is termed the impulse of the rupture.

At this period a truss should be constantly worn. If m
to fit comfortably, it will prevent the further escape of
viscera; and by counteracting their propelling force aga
the parietal peritonæum, the development of the hernial sa
arrested.

As the hernia descends further from the internal ingu
ring, it produces a swelling in the inguinal canal. The l
axis of the tumour is parallel with Poupart's ligament, and th
fore follows the oblique direction of that firm, fibrous struct
from above, downwards and inwards. This bubonocele, as
tumour is usually called, is covered by the integuments of

groin and the aponeurosis of the external abdominal oblique muscle. Along its superior border it is overlapped by the free edge of the internal oblique and transversalis muscles; along its inferior by the cremaster muscle. It lies upon the internal abdominal fascia as it emerges at the internal inguinal ring, afterwards upon the conjoined tendons of the internal oblique and transversalis muscles, just before it reaches the external inguinal ring. Under these dispositions of the fleshy and tendinous fibres of the abdominal muscles, the hernial sac with its contents is in a very especial manner under the influence of their contractions; more especially in the region of its mouth and neck: hence a frequent impediment to the reduction of a hernia. The spermatic cord usually lies behind the tumour at the internal inguinal ring, and is attached to the posterior surface of the sac as it traverses the inguinal canal.

As the development of the sac advances, it is pushed through the external inguinal ring, over the os pubis, and into the scrotum. As the hernia points at the external inguinal ring, it forms a somewhat globular swelling; but as its bulk increases in its progress towards the fundus of the scrotum, the shape of the tumour is generally pyriform, when the scrotum is distended with the hernia. In the body of the tumour contractions or depressions, generally following an oblique or transverse direction, are occasionally observable. Such appearances are due to the more or less yielding tissues of the scrotum.

The testis is usually below the tumour, sometimes behind it. The elementary structures of the spermatic cord may be traced along its posterior or outer boundary, generally close together, side by side, but sometimes, though very rarely, separated from each other.

When the hernia is reduced, the forefinger may be passed with facility into the abdominal cavity through the external inguinal ring, the inguinal canal, much shortened, and the internal inguinal ring. This is practicable on account of the approximation of those rings taking place from the pressure of the hernia and the relaxation of the surrounding structures. The mouth of the sac and the inguinal apertures are indeed sometimes so stretched that the finger may be freely passed to the abdominal surface of the symphysis pubis; and the pulsation of the epigastric artery, or of the external iliac, may be felt in the usual situations of those vessels.

A tabular arrangement of the characteristics of the three varieties o inguinal hernia in males.

A. Into the VAGINAL PROCESS of the PERITONÆUM. (*Hernia congenita* Halleri.)	B. Into the FUNICULAR PORTION of the vaginal process of the peritonæum.	C. INGUINO-SCROT tissues of the
1. Is developed most commonly in infancy; occasionally in youth; rarely in adult life.	1. Is developed frequently in infancy; often in youth and in adult life.	1. Occurs in believe, exclusiv
2. Is suddenly produced.	2. The same.	2. Is slowly p
3. At once descends along the inguinal canal into the scrotum.	3. The same.	3. By slow d verses the ingu and scrotum.
4. May rest in the inguinal canal when the testis is *not* in the scrotum.	4. May rest in the inguinal canal when the testis *is* in the scrotum.	4. May remai guinal canal for nite period, the in the scrotum.
5. Envelopes the testis, and lies in contact with that organ.	5. The testis, at the fundus of the scrotum, occupies its own serous sac, which separates it from the hernia. It usually produces a very distinct prominence at this part.	5. Is separate testis, which is at of the scrotum,
6. The orifice of the hernial sac is contracted, and corresponds with the site of the internal abdominal ring.	6. The same.	6. Orifice of th and near the ex dominal ring.
7. Neck of the sack long and tubular; it lies in the inguinal canal, between the rings, which are *not* approximated, even in the adult.	7. The same.	7. Neck of sac lated; inguinal c ened; the rings proximated.
8. Hernial sac a direct, congenital prolongation of the peritonæum; tubular when not distended with a hernia. It reaches the testis in the scrotum, and envelopes it. Thus there is a congenital serous canal to receive the hernia.	8. Hernial sac, a direct congenital prolongation of the peritonæum; tubular when not distended with a hernia. It does not extend into the scrotum so low as the testis. A congenital serous canal exists to receive the hernia.	8. Hernial sac mation, and slo loped by the press abdominal viscer the parietal abdon tonæum, which by before the herni formed into a s Here the hernia own sac by pus peritonæum befor tubular character is wanting.

Diagnostication.—Every inguinal hernia escapes from the abdominal cavity above Poupart's ligament. If, therefore, the umour formed by an inguinal protrusion be examined whilst n the inguinal canal, Poupart's ligament is traceable along its nferior border, and the opening where the tumour seems to make its escape from the abdomen is above the same fibrous band. It may be always distinguished, then, from crural hernia; for that kind generally escapes through the crural ring, which s situated behind and below Poupart's ligament, and that ligament may be always traced along the superior border of the tumour. Figs. 268, 272 should be compared.

Again, an inguinal hernia reaches the scrotum through the external inguinal ring, the outer pillar of which is formed by the pubic attachment of Poupart's ligament to the spinous process of the pubes. Now place the tip of the finger upon the last-mentioned process of bone, and if the neck of the tumour lies to its inner side, or between the finger and the symphisis pubes, the tumour must be formed by a protrusion which has passed through the external inguinal ring; a fact sufficiently demonstrative of an inguinal hernia. Should the tumour be to the outer side of the finger, the probability is that the hernia has passed through the crural ring.

Differential diagnostication.—The surgeon is often required to distinguish between inguino-scrotal hernia and some other tumours developed in the inguinal region and scrotum.

These are—1st, the different kinds of hydrocele; 2d, the encysted spermatocele connected with the epididymis; 3d, varicocele of the spermatic veins; 4th, inflammation of an old hernial sac, and the results of such inflammation; 5th, inflammatory affections and other diseases of the testis, the cord, and their coverings; 6th, hæmatocele; 7th, malpositions of the testis; 8th, inflammatory and other diseases of the inguinal lymphatic glands; 9th, growths of fat in the connective tissue of the inguinal canal and upon the spermatic cord; 10th, diseases of the integuments of the scrotum, especially growths, as elephantiasis.

The nature of these diseases being described in other parts of this work, the observations we have to make in relation to the differential diagnosis between them and inguino-scrotal ruptures may be condensed into a tabular form. This plan was suggested by the perusal of a chapter written by M. Vidal (de Cassis), entitled ‘Chronic tumours of the scrotum considered in nostic point of view.’ *

To one variety of hydrocele it is perhaps necessary to special allusion. In rare instances serum collects in the process of the peritonæum, when its ventral orifice is and the accumulated fluid may be pressed out of the into the peritoneal cavity through that aperture. Thi tion usually occurs in infants, but we have seen it in complicated even with a hernia. The differential diag stated in the table.

The chronic tumours of the scrotum may be arrange divisions:

I. The reducible. (*See table on next page.*)
II. The irreducible. (*See table on p.* 756.)

In the first division there are:

1. Inguinal hernia.
2. Hydrocele of the vaginal process of the periton
3. Hydrocele of the funicular portion of the same p
4. Varicocele of the spermatic veins.

The tumours in the second division are composed ver of fluids only, sometimes almost exclusively of solids, bu sionally of both solids and fluids in variable proportions.

Those composed of fluids are—1, hydrocele of the tunica alis propria testis; 2, hæmatocele in the same sac wh developed; 3, encysted spermatocele connected with th dymis; 4, hydrocele of the spermatic cord.

Those formed by solids, or of solids and fluids, are- diseases of the testis, *a*, of inflammatory origin, *b*, speci growths; 2, hæmatocele of some standing in which have taken place; 3, diseases of the spermatic cord; 4, of fat extending from the inguinal canal into the scro in its tissues; 5, diseases of the tissues of the scrotum.

Between the local signs of an inflamed scrotal hern especially if its orifice be plugged by omentum, and an i hernia, there is a close resemblance. But from the hi the case, and the absence of those constitutional sy which accompany an inflamed hernia, a correct diagnost may be formed.

The inflammatory conditions of the testis, the cord, its ings, and the tissues of the scrotum, do not resemble rs either in their local or constitutional manifestations. more probable that a hernial protrusion might be cond to be some affection of those organs, than that they l be mistaken for a hernia. The history of the case usually es all doubt as to its nature.

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* *Traité de Path. externe*, edit. 1841, vol. v. p. 715.

Characteristics of the Reducible Tumours compared with Hernia.

	Their entrance or return into the abdomen.		Their passage from the abdomen.
	Characters in common.	Special characters: when without complications.	Special characters.
GUINAL ERNIA.	*All* return into the abdomen most easily when the patient lies down on the back and when the abdominal muscles are relaxed.	1. *Hernia* enters most readily. When once commenced, passes in quickly and suddenly. Entrance complete. Opaque and thick neck of tumour. Testis may or may not be perceptible until reduced. *No* vibration.	1. Is developed from above, descends when the patient rises or exerts the abdominal muscles, and more quickly than others. The finger pressed over the ring prevents its descent.
YDROCELE INAL PROOF PERIM.	—	2. *Hydrocele* of vaginal process of peritonæum enters slowly, and never suddenly. Entrance complete. Translucent and small neck of tumour. Testis imperceptible until the fluid has entered the abdomen. Vibration.	2. Seems to be developed from below upwards. The serum sometimes remains in spite of the horizontal position.
YDROCELE UNICULAR N OF VA- PROCESS ITONÆUM.	—	3. *Hydrocele* of funicular division of vaginal process of peritonæum enters like No. 2. Entrance complete. Translucent. Neck of tumour may pass into inguinal canal. Testis perceptible at fundus of tumour. Vibration.	3. Similar to No. 2.
ARICOCELE.	—	4. *Varicocele* enters very slowly. Entrance not complete, the bulk of tumour only diminished. *No* vibration.	4. The tumour increases like hernia when the patient rises; but it increases also if pressure be made over the course of the spermatic veins in the inguinal canal, or if the blood be retarded in its passage along them in any way.

Characteristics of the Irreducible Tumours compared with Hernia.

Disease.	Weight.	Translucency.	Fluctuation and vibration.	Relation of testis to tumour.	Figure and development.	Size.	Consistence.	Pain.
Hernia	Lighter than either the fluid or solid tumours.	Very rarely so; generally opaque.	Only when fluid co-exists with the hernia.	Position variable, but the testis usually discoverable.	Pyriform, but with *thick* neck. Occasionally globular or ovoid. Outline regular. Begins at neck of scrotum and descends.	Variable; at times very large.	Soft and yielding, except it be omental.	Painless unless diseased.
Fluid Tumours.	Hæmatocele rather heavier than hydrocele.	Hydrocele particularly so. In rare cases opaque. Hæmatocele opaque.	Distinct; vibration very characteristic, as in hydrocele.	Perceptible in spermatocele; not in hydrocele of tunica vaginalis propria testis, usually.	Pyriform, but with very thin neck. Outline very regular. Globular as hydrocele of spermatic cord. Oblong as in	Rarely very large.	Yielding and elastic. Exceedingly incompressible as hydrocele of cord.	Painless, unless testis be squeezed, usually.

Treatment.—The palliative treatment of reducible oblique inguinal hernia consists in maintaining perfect and unintermitting retention of the hernia; for if this be done carefully and with method, a permanent cure may be effected, especially in children. The cases of hernia into the vaginal process, if carefully treated immediately after the first appearance of the rupture, and before the walls of that canal have been stretched for any length of time, are sometimes cured by the employment of a well-adjusted truss. But in the use of this instrument before puberty, great attention must be given to the site of the testis; for the pad of the truss might press injuriously upon that organ. The spring of the truss must not be too powerful; for if the pressure of the pad upon the walls of the abdomen is very strong, their tissues are absorbed where the pad presses, and they become, in consequence, seriously weakened. The pad should prevent the escape of the hernia by its accurate adjustment, rather than by the force with which it presses against those apertures through which the hernia passes. On this account, each individual requires to have a truss adapted to the configuration of the body. The pad should be applied over the internal inguinal ring, pressing gently upon the inguinal canal to afford support to the tissues of that part, and not upon he external inguinal ring and pubes, as we have often seen it pplied. The patient should be enjoined to wear the truss unnterruptedly, except only when lying in bed; to adjust it careully before leaving bed in the morning, and on no account to ermit the hernia to remain for a moment in the sac.

When the hernia has acquired large dimensions, or has become rreducible, a particular form of appliance, termed the bag-truss, ecomes indispensable.

The radicle cure of reducible inguinal hernia.—The mode of performing the operation as practised by Wutzer is as follows a special instrument is required, which consists of two pieces of wood and a flexible needle):

The patient being placed in the most favourable position, and he rupture carefully reduced, the forefinger of the operator is used to invaginate the integuments and to push the fundus of he sac into its orifice. The cylindrical wooden plug is next nserted in place of the finger, and the needle thrust through he invaginated skin, sac, anterior wall of the inguinal canal, and skin of the groin. The grooved piece of wood is then laid over the inguinal canal, held in position by the needle, and

screwed tightly to the first piece, i
between the tissues thus compresse
is retained for seven or ten days, a
after its removal, a pad should be
and prevent the extrusion of the in

The commonly unsuccessful issue
on the principle of invagination, as
and others, induced Mr. Wood to s
This he attributes to the want of u
tissues and those lying behind the
operation is to induce adhesion
hernial sac and the entire circumfe
entire obliteration of the other part
flammation. Unfortunately, howe
not uphold the theory.

Mr. Wood * has contrived an op
the chances of failure above men
operator requires a special needl
wood, glass, or porcelain, and some
contraction of the abdominal mu
controlled by the influence of chlor

After an incision has been ma
scrotum, the forefinger of the op
hernial sac as far as possible into
front of the spermatic cord, at the
tissues. The needle is next carri
and passed through the conjoine
oblique and transversalis muscles,
nal inguinal ring, and the integum
to avoid including the spermatic c
through the eye of the needle, a
leaving one end of the thread in
still threaded, is next passed thro
external abdominal oblique muscle
and opposite to the internal inguin
out through the opening in the i
A loop of thread is left behind, and
still in it, is again passed through
tendons which lies over the rectus

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* *On Rupture: Inguinal, Crural, and U*
London, 1863.

spine and the inner pillar of the ring. Its point is now brought through the first puncture for the third time, and the needle altogether withdrawn from the thread.

Thus a loop and two ends of thread pass through one opening in the skin. 'Two portions of thread are thus placed across the hernial canal, invaginated fascia and sac, closely embracing, but not including, the spermatic cord, and connecting the posterior or deep wall with the anterior and superficial, perforating the aponeurosis of the external abdominal oblique muscle in three places; but escaping by the same aperture in the skin' (Wood). The compress is next applied over the canal obliquely, and the two ends of the thread passed under the loop and tied in such a manner as to give equable adjustment to the pressure.

The after-treatment of the case is the same as that adopted in similar operations.

Mr. Wood describes several modifications of this operation in which wire was used with good results.

The taxis.—When a surgeon has a case of irreducible inguinal hernia to treat, his attention should be particularly devoted to a very careful examination of the tumour, in order to diagnosticate the variety under observation. He should ascertain with accuracy the anatomical relations of the tumour to the surrounding parts; the position of the testis, especially; the length of time the patient has been ruptured; the mode of development of the hernia, whether suddenly or slowly; the treatment pursued to prevent the protrusion from taking place; and the history of the present state of the rupture.

Having determined the variety, if the state of the tumour permit, he may employ gentle pressure in order to reduce the protrusion, remembering the direction or course it has taken, and the circumstances which probably cause the impediment to ts reduction. The abdominal muscles must be relaxed as much as possible whilst the patient lies on the back.

It is only necessary to describe, in this place, the manipulative proceedings, as the constitutional measures employed to render them more effective have been detailed at page 696. A very much larger proportion of the cases of inguinal hernia are now reduced by taxis than formerly. This is due to the use of chloroform, the effects of which in producing total annihilation of the contractile function of muscular tissue are so important. Small inguino-scrotal protrusions are not reduced with the same facility as large ones. When such a protrusion occ a young person, and has been only recently developed, a fair trial of the taxis, when the patient is fully under the ence of chloroform, and the efforts to reduce it have faile delay in removing the impediment to the replacement hernia is reprehensible. To resort to any other measure necessitates the occupation of time, is only to aband sufferer to additional risk of the loss of life.

If the protrusion be compound, that is to say, when sists of a large mass of omentum and a very small knu bowel, the reduction of the latter is effected with di The same thing occurs when the hernia is one of irre omentum of long standing, from old adhesions, and a piece of bowel. Also, when the sac is distended and re very tense by a considerable effusion of serum. The eff the surgeon to reduce the bowel are thereby rendered ab for if the serum cannot be made to pass through the mo the sac, into the abdomen, the hernia never will.

The operation.—The patient should lie on the back, wi pelvic region slightly elevated, unless some firm, resisting as a mattress, cushion, or table, be underneath. The mical points which the surgeon particularly wishes to re display in the cutting operation are, the external inguina the aponeurosis of the external abdominal oblique musc internal inguinal ring, and the mouth of the hernial sac. various structures which constitute the coverings of the h sac need not be displayed with rigorous anatomical pre They differ exceedingly in density and development in di cases. The length of the incision should not be propor to the size of the hernia. Its length must be just suffic expose freely the anatomical points, alluded to above, a more. In ordinary cases, the point of the scalpel shou inserted through the integuments at about one to two above the assumed centre of the external inguinal ring carried downwards upon the anterior surface of the tumo terminate about two or three inches below the same The margins of the external inguinal ring are next car exposed, and their relations to the tumour examined. should not be cut unless it be imperatively required to The deeper coverings of the hernial sac are next car incised, with or without the assistance of a grooved dire until that important structure is reached.

The operator, pressing his finger upon the sac, next insinuates it through the external inguinal ring, in order to ascertain if there be any structures which firmly encircle the neck and orifice of the sac outside. Should he discover any, a grooved director may be guided by the finger underneath them, and they may be cut. After slight pressure made upon the sac, its contents are sometimes returned into the abdomen at this stage of the operation. If their reduction be not practicable, the peritoneal sac must next be opened. It must be done after the manner described at p. 708, and with great care. Probably some serum will escape when the sac is cut, but this is not always the case. The opening in the sac requires to be sufficiently large to allow the operator to reach its orifice easily, and to examine its contents. The index finger is now passed along the anterior surface of the protrusion upwards towards the mouth of the sac, when an impediment to its further passage is encountered. The tissues which bound this narrow opening constitute the impediment to the reduction of the hernia. The operator next passes the hernia bistoury along a grooved director, or upon his finger, through the mouth of the sac, and divides the structures in contact with the knife sufficiently to allow the ungual phalanx to be passed freely into the abdominal cavity. The direction of this incision should be parallel with the linea alba. A few small arteries are occasionally cut during the operation, which may be twisted immediately before further proceeding.

Oblique inguinal hernia in the female sex.—This variety occurs at very early periods of life. In fact, with the exception of umbilical hernia, it is the only kind developed before five years of age. Even until the age of puberty it is more common than any other variety. Its development in infancy is due to the patulous state of the vaginal process of the peritonæum, otherwise known by the name of the canal of Nuck. Doubtless such a condition of this process remains throughout early life, into which a hernia occasionally and suddenly descends. In the adult female this hernia generally forms slowly after thirty years of age. But I have met with double inguinal hernia in a well-formed woman aged only twenty-four years, who had never been pregnant; she had worked hard, however.

Its anatomical relations are alike in both sexes, merely substituting the round ligament in the female for the sperma cord of the male, and the labium pudendi for the scrotum.

It is commonly believed that inguinal hernia is mu more rarely met with in woman than femoral. However, belief seems to be founded on an error. Mr. Kingdon's valu tables show that in the years 1860 and 1861, 1,582 female all ages, suffering with either one variety of hernia or the ot came under his observation. Of these 761 were afflicted inguinal hernia, and 821 with femoral. Or, inguinal he was only thirty less than half the total number, whilst fem was but thirty more than half. Mr. Kingdon told me this that it is not uncommon to feel the ovary in the sac of an guinal hernia of an infant.

The tumour formed by an inguino-labial hernia ra attains the size so often reached by inguino-scrotal. Still have seen one which descended more than half-way below middle of the thigh, and the coverings of which had becom attenuated that the convolutions of the intestines were tinctly visible. When of moderate size, it is generally a more globular figure, and it has a longer and more c tracted, or more narrow and cylindrical neck, than in the m sex.

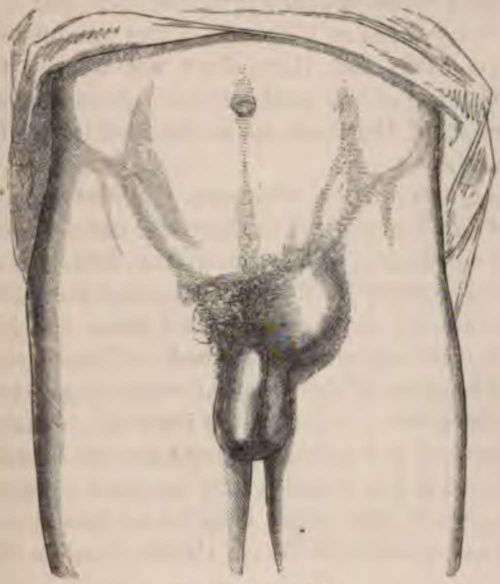
In forming a correct diagnostication of this hernia in female, the same anatomical points must be taken as gui which have been already described when that in the male was under consideration. The surgeon should, however, p ticularly remember that a hydrocele of the round ligament of the canal of Nuck, is occasionally developed, which mi lead to an error in diagnosis.

The palliative measures described as being suitable in treatment of cases of inguinal hernia in the male sex are ap cable in these also; but if the hernia become strangula the surgeon must regard the accidents arising from misapp taxis, and delay in liberating the bowel with very great picion, and act with promptitude and decision. In the ca we have seen, under these circumstances, the symptoms h usually been rather severe at an early period of the attack; in those upon which we have been required to operate, impediment to the reduction of the bowel was at the orifice the sac, and certainly insuperable without a cutting operati

In the female sex, the operator must be guided by the sa anatomical points in his attempt to reach the mouth of hernial sac as in the male. And he should remember that, occasionally although very rarely, the bowel may be constricted by a contraction of the sac itself near the external inguinal ring, and not by its ventral orifice only.

Direct inguinal hernia.—The variety of inguinal hernia characterised by the term 'direct' occurs in both sexes. It belongs to that class in which the hernial sac is fòrmed slowly, or is an accidental or acquired formation. The only exception to the slow mode of formation is in those rare cases when the structures immediately behind the external inguinal ring are lacerated by violence and a hernia protrudes. It is never the result of a congenital imperfection. This variety is sometimes styled the internal inguinal, from the fact that the mouth of the sac, where it is continuous with the parietal abdominal peritonæum, is placed to the inside of the internal epigastric artery. It is comparatively rare.

Fig. 271.



Direct inguinal hernia.

At its commencement it forms a prominence where it points behind the external inguinal ring, through which it passes into the upper part of the scrotum. The outline of the tumour which it forms is more globular oblique course of the variety bef be produced by something which from the cavity of the abdomen. name. The mouth of the sac is cl pubic attachment of the rectus mu which may be much more easily fel than in the oblique variety. On t the sac the pulsations of the inter felt. The finger enters the abdomi in direct inguinal hernia than in amination from a short distance it ing through the vertical or long a with the linea alba, and there inclining or curving of the neck towards the crest of the ilium, as oblique inguinal.

In its passage from the abdo traverses that small portion of the mediately behind the external ingu which form that part of the floor o before the hernia, or they are lac escapes through the opening so f the conjoined tendons of the inte muscles and the pubic portion of The spermatic cord and round lig hernial sac until it has reached When it has passed that point, t are usually less identified with it variety.

The diagnostication between t and oblique must be formed und before described.

The palliative treatment require which must be so constructed as abdominal walls posterior to the e

The method of exposing and liberate a strangulated bowel d description here. Facts, howev after the division of those structu inguinal ring, the spermatic cord distinct, and that the deeply-seat are often very attenuated. Considerable care is therefore required in the operation of incising them.

Inguinal herniæ sometimes pass through abnormal apertures in the aponeurosis of the external abdominal oblique muscle.—It would be an oversight not to allude to the fact, that an inguinal hernia sometimes passes through an opening or division of the fibres in the aponeurosis of the external abdominal oblique muscle close to the ring, and not through the true external inguinal ring, which is then traversed by the spermatic cord alone. Such anatomical varieties are rare, and would only require some slight modification of the operation, to meet their peculiarities.

Femoral hernia, also called crural or merocele, was not accurately distinguished from some forms of inguinal until the middle of the 17th century. Its designation in a measure indicates the region of the body where it forms a tumour, which, however, may be stated, with greater precision, to be the upper and inner part of the thigh. Its anatomical relations were not accurately defined for many years after it was known to pursue a different course to inguinal; and it is curious to follow the gradual development of our knowledge of those structures immediately interested in, or associated with, this variety of rupture.

The principal anatomical points which should be examined, from the outside of the thigh as well as from within the abdomen, are the following: the ligament of Fallopius or of Poupart; Gimbernat's ligament; the crural canal or ring; the fascia transversalis and iliaca, or the internal abdominal fascia of the iliac fossa; the falciform process of the fascia lata and the saphenous opening; and, when a hernial sac exists, the fascia propria of Sir Astley Cooper.*

Relations of the mouth of the hernial sac to the internal epigastric artery and vein.—The orifice of the peritoneal sac holds im-

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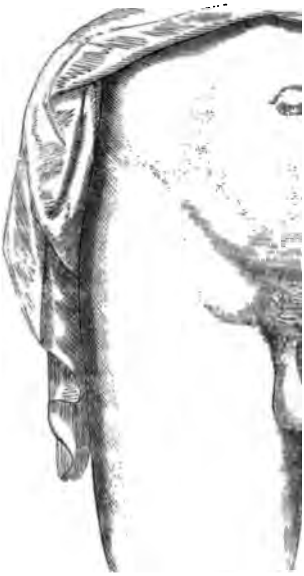
* The anatomy of these various parts must be assumed to be known by the reader. We may, however, allude here to the importance of noticing the structure last named, viz., the fascia propria, first described by Sir Astley Cooper from a dissection made in 1800, and which is still preserved in the Museum of Guy's Hospital (No. 2503). It is an envelope which is found on the outside of the peritoneal sac, usually separated from it by a layer of adipose tissue.

portant relations to the intern
pathologists have established th
kind of crural hernia on this b
orifice of the sac is situated to t
external crural hernia; the seco
of the same vessels, the middle c
the third, in which it is placed t

FIG. 2



The illustration represents double femoral h
being remarkably distinct *abo*

of the obliterated umbilical arter
are very rare.

Here we may also state that
sionally given off from the inte
that when the former vessel lies
the hernial sac, the obturator
its neck, and dip down by its in
foramen.

A very interesting case, with
recorded by Mr. Spence in th
July 1855. The pulsation of a
finger before its division.

Varieties in the course pursued by the sac of a crural hernia.— a memoir published by Dr. Le Gendre, he describes four re varieties of crural hernia.* They may indeed be regarded ther as curiosities, on account of their rarity.

1. The hernia, as soon as it traverses the crural ring, passes rectly internal to and behind the femoral vessels, and rests on e pectineus muscle, the aponeurosis of which sometimes forms envelope to it; this he calls the pectineal crural hernia, on count of its situation, or the hernia of Cloquet, in honour of e surgeon who was the first to describe it. Callisen, Vidal e Cassis), M. Richet, Dr. Le Gendre, and Mr. J. Adams,† have corded similar cases.

2. This variety, although placed internal to the femoral ssels, is, however, rather far from them; it passes through at resisting fibrous structure which bounds the crural canal d sheath internally; that is to say, the ligament of Gimbernat. augier, who was the first to notice it, calls it the *crural hernia rough Gimbernat's ligament*, or the hernia of Laugier. Cruilhier, Demeaux, Nuhn, and Le Gendre have also dissected ses of this kind.

3. This comprehends the variety of crural hernia which sselbach has so well described and figured.‡ The hernia in s case traverses several openings in the fascia cribriformis, d then presents several distinct lobes, which give it a chateristic appearance; it is *the hernia with a diverticulum ough the cribriform fascia*, or the hernia of Hesselbach. Gendre and Malgaigne have dissected examples of this riety of rupture, which the former believes to be not so very re.

4. Lastly, a variety in which the hernia, after having escaped neath Poupart's ligament and traversed the cribriform fascia, nds one or more prolongations through the superficial fascia. his variety may be termed *the crural hernia with a diverticulum rough the superficial fascia*, or the hernia of Astley Cooper.§ e Gendre describes a dissection of a case of this kind, and ublishes a drawing of it in his work.

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* *Mém. sur quelques variétés rares de la Hernie crurale; avec 6 planches.* 8vo. ris, 1858.

† *Med.-Chir. Trans.* 1860, p. 127.

‡ *De ortu et progressu Herniarum*, 4to, 1816.

§ *Anatomical and Surgical Treatment of Abdominal Hernia*, chap xx.; case Mrs. Sheffield.

We may add a variety describ
the hernia was situated external

Development of the sac of a cru
of a crural hernia is always a se
It is never the result of a conger
observing the early stage of a
occurs in post-mortem examinat
may be pressed into a fossa, or
inches in length, between the
ligament. An observer is enabl
parietal peritonæum down upon t
or more below Poupart's ligam
most favourable for the study o
crural hernia. By degrees suc
peritonæum at the crural ring be
into a sac by the repeated and c
which forms the hernia. The sa
thigh beneath Poupart's ligame
lower and lower towards the kne
tion towards the crest of the iliu
tumour lies parallel with Pou
fascia lata. When large, the t
ment, and seems to occupy the
canal. But in every case of cru
by a protrusion which has esca
below and behind Poupart's liga
able to trace that structure runn

Crural hernia rarely increase
occasionally, after an operation
lated bowel, when the tissues a
been weakened by cutting them,
to employ the support afforded
of the alimentary canal may pro
of the sac become so remarkabl
movement of the intestinal c
through them; so attenuated a
that the vitality of the integum
very rare variety, as regards
The tumour was of a cylindric
wards and inwards over the thig

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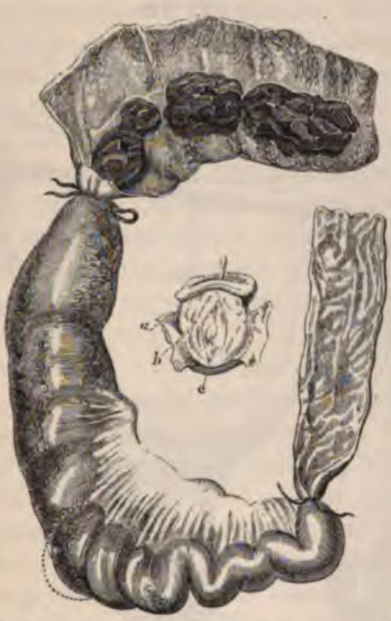
* *Trans. Path. S*

of that region. The great size of the tumour is not a feature of serious importance, for a very small sac, having a contracted orifice, more readily entangles the hernia and prevents its reduction.

Diagnostication; first, from other kinds of hernia. Those with which crural may be confounded are inguinal above Poupart's ligament, and obturator below the horizontal ramus of the pubes. It would seem to be impossible, however, to mistake a crural hernia for an inguinal, or *vice versâ*, if the observer will but carefully trace the outline of Poupart's ligament. But he must remember that the fundus of the sac of a crural hernia sometimes takes a course upwards, and overlies

FIG. 273.

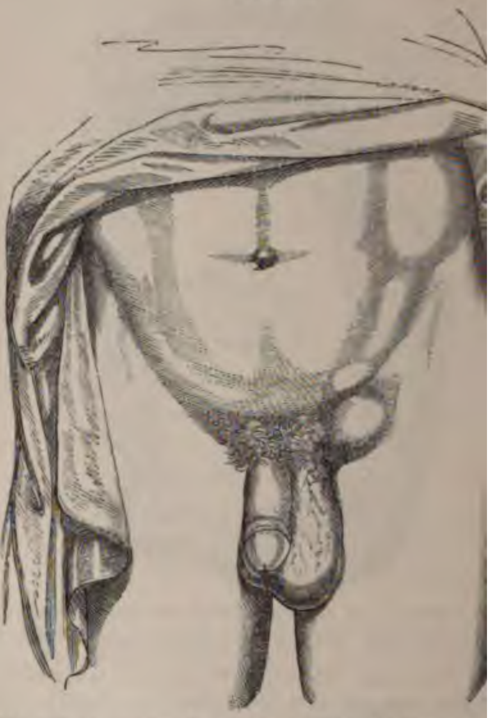


A piece of the ileum about three feet from the cæcum removed from a patient, aged fifty-seven, who had been operated upon for strangulated femoral hernia of seventy-three hours' duration. She survived the operation forty hours, and the first symptoms of the attack 118 hours. She had been in bad health previously, was extremely emaciated, and sank from exhaustion. Large and hard masses of scybalæ were found in the ileum as shown in the part of the bowel cut open. The small piece of bowel which had been in the sac, and was but little diseased, is indicated by the dotted line. The contracted and opened bowel below this contained mucus only.

The figure in the centre represents the sac. Through its mouth a piece of glass rod is inserted; and although the sac is very small, it was remarkable for the layer of fat, *b*, between the peritonæum, *c*, which is not cut, and the fascia propria, *a*. (Museum Guy's Hospital; No. 477^{a}.)

that structure. Nevertheless, the course of Poup
can be always ascertained with more or less prec
an inguinal hernia overlies it from above—a ve
rence—or a crural from below, which is very
fingers of the examiner can still trace it from th
pubes—of course, in one case more distinctly tha
If the whole of the tumour lies below the liga

FIG. 274.



Demonstrates the appearances produced by a small inguinal hernia j
external inguinal ring, and a medium-sized femoral hernia, both
and the outline of Poupart's ligament between those tumours.
the scrotum a tumour is produced by hydrocele of the tuni
(From nature, and copied from a drawing in Guy's Hospital M

neck can be traced continuous with the crural ape
tents have escaped beneath Poupart's ligament, and
rupture; but if the contrary, it is an inguinal, es
the neck be traceable to the internal inguinal rin
distinguishable from inguino-labial hernia by plac
on the spine of the pubes, or upon the attach

endon of the adductor longus into that point of bone ; for even n very fat persons the pubic spine can be always felt. If the umour be to its outer side, the protrusion has escaped below oupart's ligament, in which case it is crural rupture ; if, on the ontrary, it has passed through the external inguinal ring, it ust be an inguinal. The same point of bone will aid in dis-nguishing between a pudendal hernia and a crural.

A crural hernia is much more superficially seated than an bturator, and in consequence the tumour which the latter pro-uces is neither so prominent nor so well defined as the former. he latter escapes from the pelvis behind the horizontal ramus the pubes, and therefore Gimbernat's ligament and the crural perture can be felt. The elevation of the integuments pro-uced by an obturator hernia is certainly in the locality of the rural aperture ; but the depth of the tumour is its striking ature, and the facility with which the crural aperture can be lt is pathognomonic of the relations of the protrusion.

Crural hernia requires to be distinguished from other diseases hich occur in the same region.

1. From *psoas abscess.*—The history of the case, the locality f the swelling, and the results of a palpable examination of the umour, are quite different from hernia. Psoas abscess is enerally preceded by pain in the back, constitutional distur-ance, and inability to extend the hip-joint completely without ain. These symptoms do not accompany a crural hernia. soas abscess does not burrow down below Poupart's ligament the crural ring, but to the outer side of the sheath of the moral vessels. But an infallible test that the tumour is rmed by a circumscribed collection of fluid is obtained by acing the patient flat on the back, and then gently applying e right hand above Poupart's ligament and the left below it, *vice versâ.* When pressure is made upon the swelling with ne hand only, the other is elevated ; and when the action is versed, the opposite effect takes place. With this result on anipulation of the swelling, there can be no doubt of the nature he disease.

2. *Enlargement of the lymphatic glands.*—The correct history the development of the swelling will aid in forming the dia-nosis, especially its permanence and progressive increase. If ere be a suspicion that the tumour is of glandular origin, it as well to institute a careful examination of those somewhat

secluded regions in which certain specific ulceratio nately occur, giving rise to angioleucitis.

3. *Dilated and varicose veins.*—We have seen a and a tumour formed of varicose veins occupying t femoral hernia; but the diagnosis was easily made the patient in the recumbent posture, when the swe peared. Digital pressure being made at the crural r the vein, the swelling was at once reproduced.

4. *Cysts* in the superficial fascia. Cysts are although very rarely, developed in the region of the in some cases associated with hernia, but sometin The permanency of the swelling, its persistent and size, the fluctuation discoverable on pressure, and th the case, are aids to correct diagnostication. Wh present, and there are any symptoms suggestive of s bowel, the propriety of accurately ascertaining the the tumour by an exploration of its interior cannot

Palliative treatment.—The treatment of crural he use of trusses is most important. The prevention o tion of the sac is the primary point to which atten be directed; and this may be accomplished by givi in the region of the crural ring, especially if it be maintained.

We gladly avail ourselves of the large experie Kingdon in offering a few observations regarding trusses in this variety of hernia. In a truss to p escape of a crural hernia, the spring should fall suddenly from the point where it passes around the along Poupart's ligament. The pad should be rathe convex. The cross-strap should fasten high up on t of the spring, in order to keep the pad well down in The thigh-strap should start from near the pad, a after encircling the thigh, to the pad itself. When ligament, or rather the whole crural arch, is lax, backwards and forwards with the varying size of the the pad should press upon that ligament; for then aperture is made smaller, and the rupture more efficie tained. For that purpose a larger and flatter pad But when the crural arch is strong and steady, the s is both more effective and, by reason of its small convenient and less incommodious. Also, it is les displacement by the movements of the hip-joint.

When the rupture is large, or where it comes down under the fascia lata, it is necessary to use a thigh-belt, with a triangular pad projecting on the inner surface, and forming a soft continuation of the pad, to fill the triangular space where the cribriform fascia occupies the saphenous opening of the fascia lata.

Sometimes after an operation, in which Gimbernat's ligament has been freely divided, a cross tongue in addition, to buckle to the free end of the truss, is needed.

Irreducible crural rupture of course requires a hollow pad, whether epiplocele purely, or enterocele.

Attempts have been made to effect a radical cure of crural rupture by a cutting operation. The patients recovered from its effects; but we have no data by which to arrive at any conclusion as regards the advantages obtained.

Crural hernia very rarely occurs before puberty. I have seen one in a girl ten years old.

Crural hernia is much more common in the female sex than in the male. But the general belief, that it is much more common in women than inguinal, does not appear to be founded on facts. The following table demonstrates the proportions in which they occur. The comparative numerical equality is explained by the circumstance, that before puberty inguinal hernia is common, whilst crural is extremely rare. In 193 girls before 15 years of age, Mr. Kingdon met with 184 cases of inguinal rupture, and only 9 of crural. Even to the age of 20 years, the cases of inguinal hernia are much more common than femoral, as the subjoined table shows. In a total of 1,442 ruptured females, at all ages from birth upwards, the majority of the cases of crural hernia over inguinal was only 54.

After twenty years of age, crural hernia is much more commonly developed than inguinal.

Decades.	Inguinal.		Femoral.
Birth to 10 years	146		1
11 to 20 "	103		37
21 to 30 "	153		180
31 to 40 "	164		252
41 to 50 "	76		158
51 to 60 "	33		84
61 and upwards	19		36
Total	694	+	748 = 1,442 cases.[*]

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[*] This table was made from Mr. Kingdon's reports of the City of London

Total cases of femoral	748
Deduct cases between 20 and 40 years .	432
At all other ages	316
Deduct cases before 20 years of age .	38
After 40 years of age	278

This table demonstrates a fact for which the patholog be scarcely prepared, viz., that the largest number of crural hernia is developed during those years usually the prime of life, *i.e.* in women between twenty years forty.

But it must be observed that this happens to be tha of life when parturition is most frequent, and whe quently the peritonæum and the tissues of the abdomin become much stretched by the development of the gravi Their power to resist the weight of the abdominal becomes diminished; hence a cause of their protrusion.

To ascertain whether there was any relation betw development of hernia and parturition, Mr. Kingdon m following table of 680 ruptured females, and found the tion of mothers to be as follows:*

	Inguinal.		Fem
Infants and girls under 16 years of age . .	87	. .	3
Single women	50	. .	61
Mothers	178	. .	262
Married women who had not borne children	19	. .	20
Total	334	+	34

And next, with a view to ascertain the influence of r pregnancies upon the development of hernia, he exami women who had been mothers before discovering the Of these, 180 women were afflicted with inguinal, 2 femoral; which gives a majority of 82 in favour of f

The influence of the first pregnancy is very remarkabl women had been mothers before discovering the hernia:

Truss Society for the years 1860 and 1861. It shows the ages of the in at the time of first discovering the hernia.

M. Malgaigne states that inguinal hernia is even more common in than crural. *L'Union méd.* 1854, p. 154.

[*] *Report,* 1860, pp. 10, 11.

	Inguinal.		Femoral.
67 had borne one child	27		40
51 „ two children	26		25
53 „ three „	22		31
55 „ four „	23		32
40 „ five „	15		25
25 „ six „	8		17
34 „ seven „	15		19
30 „ eight „	13		17
25 „ nine „	7		18
19 „ ten „	10		9
16 „ eleven „	5		11
8 „ twelve „	4		4
4 „ thirteen „	2		2
10 „ fourteen „	2		8
3 „ fifteen „	—		3
1 „ eighteen „	1		—
1 „ nineteen „	—		1
442	180	+	262 = 442

y a preceding table the fact was demonstrated that crural
ia is most commonly developed between twenty years of age
forty. Now as we know that there is a much larger num-
of females alive between twenty and forty years of age than
re forty, we might conclude that the number of cases of
al hernia is in proportion to the numbers of the population
ny respective age. Under twenty years of age this is cer-
ly not the fact, for the population at those early ages of life
course the largest, whilst cases of crural hernia are exceed-
y rare. The cause of the frequency of inguinal hernia
ng the early life of females has been before explained
761).

; is highly interesting to compare the frequency of crural
ia at various ages with the numbers of the female population
ondon at the same periods of life; and in this inquiry we
e made use of the census-table of 1851,* and Mr. Kingdon's
istics before alluded to. From those data the subjoined
le is arranged:

		Crural hernia.
Females under 20 years	493,260	38
„ from 20 to 40 years	453,809	432
„ „ 40 upwards	308,609	278
	1,255,678	748

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* Census, 1851, vol. i. p. 193, table ii.

This shows the number of cases of crural hernia in
females—

Under 20 years to be	77
Between 20 and 40	952
Above 40	901

Doubtless this calculation can only be considered a
mating to numerical accuracy; but it seems to demo
truth of the general proposition, that females betwee
of twenty and forty years are most liable to the deve
crural hernia under certain conditions. The cause of
lity is probably due to the natural condition before
coupled with its attendant circumstances, and the o
of the class of persons which would apply to public
as well as, perhaps, to configuration, and some p
causes, or hereditary influences.

Morbid states of the crural hernia. An irreducible
plocele is very often seen; an enterocele in the same s
rare. With a view to ascertain whether the stran
the bowel was in any degree influenced by the acco
or absence of omentum, we made an analysis of sixt
of strangulated crural hernia, which came immedia
our own care for operation. The proportions were eq
being thirty-one pure enteroceles, thirty entero-epip

A reducible crural epiplocele may at any time becom
give rise to local pain, and increase in size. The loc
tion of cold, and absolute rest, are the measures to b
to prevent adhesion between the rupture and its sac.
dition of an omental rupture in the groin is sometime
for angioleucitis. But the history of the case, and th
evidence derived from the absence of every primar
lymphatic irritation should suffice to remove all d
diagnosis.

Both Pott and Astley Cooper allude to circumsta
are of vital importance in the treatment of crural h
the difficulty often experienced in the reduction of sma
developed enteroceles, the rapidly extending injury of
and the severity of the constitutional symptoms whi
cited by that condition. But these features have
fully insisted upon by Mr. Bryant in a careful invest
the cases admitted into Guy's Hospital.* Out of 14

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* *Guy's Hospital Reports*, 1861.

gulated crural hernia, only 38 were reducible by the taxis. of course, is explicable by remembering that the majority h cases is not sent to the hospital until the further use e taxis is evidently unjustifiable. Ten of these cases of recent development, that is, they were strangulated on first recognised descent. This is an important feature in l hernia, bearing especially on the results of treatment in cases. It is cases of this kind which are so frequently oked by the medical attendant. He suspects that the toms exhibited by the patient are referable to a rupture, e asks the question whether there is any tumour to be felt e groin or elsewhere. Receiving a negative reply, he is nt therewith. But that should not satisfy him. The sur- should carefully examine the crural rings, and the other ns in which a hernial tumour may exist.

e mortality arising in cases of strangulated crural hernia kinds is very large; but in those where the bowel becomes gulated on the first descent, the death-rate is the largest. xperience of a large number of these cases teaches that owel should be liberated as soon as possible, and, if the be not successful when the patient is fully under the nce of chloroform, that the cutting operation should not layed a moment.

e youngest girl we have heard of suffering with strangulated l hernia was between eight and nine years old.

plication of the taxis.—The patient should lie on the back, the hip-joint more or less flexed. The surgeon, taking a on most convenient for the purpose, gently compresses the swelling, at first endeavours to diminish its size by pres- ny serous effusion that may happen to be in the sac into bdomen, and next to empty the bowel of its contents. recalling to mind the site of the crural ring, he presses owel backwards, inwards, and upwards.

operation of liberating the strangulated bowel by incision.— issues to be divided to expose the sac are, the integuments, uperficial fascia, the fascia propria, and often a layer or ng of fat. The points to be particularly observed as s for the safe and certain manipulation of the sac are, first, rt's ligament in front and above it; and, secondly, Gimber- ligament at the pubic border of its neck.

ght variation in the line, direction, or figure of the incision gh the integuments is admissible, according to the incliexternal surfaces. The muscle within the pelvis is covered b the internal abdominal fascia, that outside by the obturato fascia. The obturator nerve, artery, and vein pass through th canal from the pelvis to the thigh. The course of the cutaneous filaments of this nerve should be especially noticed; for a its trunk is in close proximity to the hernial tumour, the pre sure which the latter makes against it induces pain in tho regions where the filaments of the nerves are distributed. some cases this fact may prove a valuable aid in diagnosis, the sequel will show.

This rare variety is described as hernia through the obtu tor canal, the foramen ovale, the thyroid or obturator forame and sub-pubic femoral. In the early part of the last centu M. Garengeot[*] called the attention of surgeons to this kind hernia, which, after having escaped from the pelvis throu the obturator canal, forms a swelling among the adduct muscles and in the pubic region of the thigh. The neck of t sac lies behind the horizontal ramus of the pubes, occupies t obturator canal, and makes its way sometimes between t uppermost fibres of the external obturator muscle, at oth times above them. The fundus and body of the sac are cover by the fascia of that muscle. By the dissections of seve cases, the obturator vessels and nerve are shown to be d ferently placed as regards the tumour. Vinson[†] states that found the artery six times to the outer side of the sac, six tim to the inner side, and three times behind it. The relative po tion of this artery to the sac probably bears some relation to origin. In Mr. Stanley's case,[‡] both artery and nerve we above the hernial sac; the former to its inner side, the latt towards its outer.

Both sexes are liable to the formation of this hernia, but large majority of the cases on record occurred in females. T anatomical reasons for this are obvious.

There are cases on record in which this hernia had existe and in which the viscus was strangulated without any *loc* signs of a tumour. Mr. Hilton's case,[§] in which the entir calibre of the ileum was in the sac; and Mr. Tebay's,[||] in *which*

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[*] *Mém. de l'Acad. roy. de Chir.* t. i. part iii.

[†] Günther's *Lehre v. d. blutigen Operationen*, Abschnitt xv. § 146.

[‡] *Trans. of the Path. Society*, vol. iii. p. 94.

[§] *Med.-Chir. Trans.* xxxi. p. 323.

[||] *Med. Times and Gaz.* vol. ii. p. 270, 1852.

The hernial sac, which is never wanting, consisted alwa
a portion of the parietal peritonæum of the pelvis thrust th
the canal, and tolerably firmly attached to the parts with
it was in contact. The sac was therefore slowly formed.
this account some of the patients had experienced, durin
development of the hernia, repeated attacks of bowel de
ment, evidenced by symptoms of obstruction, termed colic
uneasiness at the inner and upper part of the thigh, an
cramp or spasmodic pains in the muscles of the femoral
and which extended down the leg.

In a large number of the cases, the acute pain in the co
the obturator nerve, described by the patient, was a
feature of the case, and pressure over the site of the e
aperture of the obturator canal gave rise to paroxysms
of great severity. It is due to the tact of Mr. Howsh
state, that he seems to have been the first writer to dwel
ticularly upon this fact, which some years afterward
strongly insisted upon by Romberg.† The only patient w
seen with this variety of hernia complained bitterly of fe
sudden pain at the upper and inner part of the right
which extended thence down the inside of the limb to the
front of the leg, foot, and great toe.

The cases of the second class are those in which the t
was discovered during life, either in consequence of its
or by a careful examination of the region in which
developed.

Dr. Roeser‡ proposed that advantage should be taken of the rectal
of the male, and the vaginal of the female, to institute a more searchi
amination of the obturator region within the pelvis; and by this me
Lorinser, in 1857, discovered an obturator hernia.§ Dr. Nuttall, of L
in the same year, in a case in which not even fulness of the adductor fo
perceptible, was induced, by the severity of the constitutional symp
strangulated bowel, and the pain caused by local pressure made directly u
obturator region, to explore that part; and his judicious treatment
warded by the discovery of a very small hernial tumour, the contents of
were returned into the abdominal cavity by gentle pressure, without inc
the sac.‖ Before this Mr. Obré had successfully operated upon a

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[*] Howship's *Practical Remarks on the Discrimination and Appear*
Surgical Disease, 1840, p. 323. Prep. in Mus. Coll. Surg., No. 1359.

[†] Romberg, in Dieffenbach's *Operative Chirurgie*, b. ii. p. 621, 8vo. *Le*
1848.

[‡] *Archiv. f. phys. Heilkunde*, 1851, p. 142 et seq.

[§] *Lehre v. blutigen Operationen*, Abschnitt xv. § 147.

[‖] *British Medical Journal*, p. 566, 1857.

DISEASES OF T

IN the following essay on Dise
treated the subjects in the
importance: Hæmorrhoids; Prol
ture; Cancer; Polypus; Pruritu
has been said in reference to ma
rectum, as this subject is considere
OF CHILDHOOD.

HÆMORRH

It has been the custom of surg
hæmorrhoids, to divide them int
external and internal. This is a
perhaps not well to deviate; f
are seen where it is impossible t
internal or external,—and, path
rhoidal tumours, wherever situat
of the same morbid elements, viz.
of the rectum, and an infiltration
still circumstances which exist,
with this disorder so modify the
numerous instances there is a wid
between those hæmorrhoidal tum
involving the gut within the sphi
I shall therefore adhere to the c

External hæmorrhoids, which ar
anus outside the sphincter, and c
composed at their first formatio
disease increases, from various i
skin around the anus becomes th
indurated and infiltrated, and t
degrees the swelling becomes larg
give much annoyance when the p

relief from pain has been procured, the bowels thoroughly cleared by a saline purgative. The employment of a lotion composed of liquor plumbi liquor ammoniæ acetatis, and spirits of wine,—on each of the latter to six ounces of the former,— shrinking and collapse of the swelling.

Not unfrequently, however, the surgeon is call where most or all of these measures have been tri the patient is suffering acutely; and on examinatio found that on one side of the anus there is a tumo cumscribed form, of a blue colour, and in a state c tension. In such an instance, the suffering is prod accumulation and coagulation of the blood; and treatment is to puncture the swelling freely wit there is an escape of coagulated or semi-fluid blood, immediate relief to the painful symptoms. The application of cold water, or the lotion above menti parts freely, will cause an almost entire removal of If, however, there is much loose and thickened sk site of the swelling, it should be removed with sha after the part has been punctured.

After repeated attacks of this nature, the an surrounded with distinct tumours, more or less pen liable to become swollen and inflamed; for this stat a surgical operation is required. It is, however, a and consists in the removal of these excrescence curved scissors. As the patient kneels upon a c upon his side, the surgeon lays hold of each tum hooked forceps, and excises it, with the scissors plac the skin. Chloroform is rarely necessary; but if th exceedingly timid, the parts may be benumbed and thus much pain may be escaped. There i very little bleeding, especially if great care be taken any of the mucous membrane.

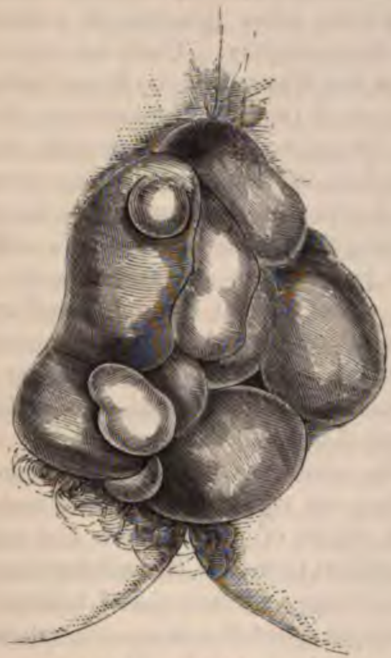
Simple as this operation is, it may in unsurgical mismanaged as to bring about serious results. If t the lax skin around the anus be taken away at the that the tumours are excised, the parts in healing wi so that severe contraction of the anus may follo patient be placed in a most miserable plight.

The same effect is likely to be produced if the mu brane at the verge of the anus is interfered with to at the table, or great irritation of the bowels, and the symptoms are extremely severe; the tumours protrude t the anus, and become constricted by the sphincter. pains are experienced in the pelvic region, and there is state of constitutional disturbance, denoted by flushe furred tongue, rapid and wiry pulse, and extreme restl If these symptoms are not relieved either by the acc induction of bleeding, or by surgical assistance, the con and inflammation increase, and to such an extent that cation of the hæmorrhoidal masses ensues, and thus is p a natural cure; but, on the other hand, it is not desi encourage this rude attempt at cure, for death may occ the violent action set up. Dr. Bushe mentions havin such a case occur.

When internal hæmorrhoids have existed for a length the general health becomes much influenced; the patie plains of indigestion, flatulence, an inability to foll ordinary occupation or amusement; moreover, if, as is fre the case, the disease be attended with periodical bleedin face becomes blanched, the pulse weak and rapid, and well-known symptoms of loss of blood ensue. This is th serious condition connected with hæmorrhoids of long sta and hence the reason why it is most important to ado proper treatment at an early period of these affections.

Internal hæmorrhoids present various appearances. making an examination of a patient who suffers from the form of the affection, the veins of the lower extremity rectum just within the anus will be found enlarged and tended, forming small fusiform tumours of a deep-blue co covered by a somewhat thickened mucous membrane. In instances, and especially where the patient complains of ing and sense of weight, with scarcely any protrusio inferior extremity of the rectum, for an inch or more, found highly congested and vascular, the mucous me having here and there distinct patches of morbid vasc from which, through a speculum, which it is necessary to such cases, blood of an arterial colour will be seen t This is the condition which the late Dr. Houston, of likened to the diseased lining membrane of the palpebræ of chronic conjunctivitis. In the majority of instanc ever, of internal hæmorrhoids, one or more distinct tu a rounded or oblong form will be seen to fill up, as it orifice of the anus. In some cases their character and size can be ascertained by an ordinary inspection; but it is always best, in order to arrive at a proper diagnosis, to throw up an injection of warm water, and allow it to be discharged before the examination is made. By this means the tumours are brought fairly down. There are frequently two or three distinct tumours, varying from the size of a cherry to that of a walnut. In one case, the diseased part presents a bright red appearance, easily

Fig. 275.



Internal Hæmorrhoids surrounded by external hæmorrhoids.

bleeds when touched, is sessile and not very raised; in another ase, the tumour is large, prominent, of a deep blue or reddish-own colour, having a large broad base, or being attached by arrower peduncle, and does not bleed. In these cases the sels appear to be largely dilated, the mucous membrane ering them being shining and tense, or thick, granular, and htly ulcerated. Besides these appearances, portions of the ous membrane, highly vascular and thickened, may be pro- ed at one or more points, as a consequence of the mechani- weight of the internal tumours. In by far the majority of cases of long-standing piles, the integ anus is in an unhealthy condition, bei now and then forming a distinct ring o

There is one point of importance co internal hæmorrhoids which should which, as far as I am aware, has not writer on this subject. The circums that occasionally instances are met with tumours are placed, as it were, in separ three distinct masses exist near the a inch or more above, other tumours disposed just in the same way. There a indicating this in the Museum of the Ro This is a condition of practical import necessary it is to make a most thor person suffering from internal piles. C occur where the ligature has been applie tumours presenting themselves at the a is thinking his proceedings are satisf patient makes some violent strainin tumour, or series of tumours, which have are forced into view. These are formed and do not generally protrude; but i expected, they must not be left alone.

As regards the structure of intern first forming, they are composed in m dilated veins, in others of dilated vein the diseased condition increases, the cell with the vessels becomes thickened and or less circumscribed space, the mucous thickened, and is bulged out by the vessels, and thus distinct tumours are f the mucous membrane becomes also ex making a section of the lower part of t of old-standing piles, the veins will dilated, sometimes partially and irregula the appearance of distinct cysts; in oth vessels will be found to be filled with fibrin. In those cases where the hæm bright red colour and sessile, not unlike ance, and easily bleeding, the structu series of small arterial ramifications;

a darker colour, and like a mulberry, they are composed
s to a large extent, although no doubt the arteries enter
l into their formation; for when the mucous covering is
d or incised, the blood which flows is of an arterial hue.
se cases of long standing, where the tumour has become
rge, and has been submitted to great irritation, a section
veal scarcely anything beyond a mass of highly-condensed
ickened cellular tissue, with some vessels penetrating the
f the tumour.

treatment of internal hæmorrhoids requires more con-
tion than that which is adopted for the disease when
ed externally. In the cases where the piles have not
l long, are not large, and give only temporary annoyance,
may be done by the patient paying simple attention to
bits, and avoiding those exciting causes which engender
isease. If it is ascertained that a sedentary life has
ed the affection, by determining the blood to the rectum,
tient should take as much walking exercise as possible;
bowels are sluggish, their action should be encouraged by
mpound rhubarb-pill, or by a teaspoonful of the confection
na; and a quarter or half a pint of cold water, or of in-
of quassia, should be thrown up the rectum daily. Dietetic
must be strictly attended to; for many patients, especially
who are robust and whose circulation is sluggish, will
that they feel much more annoyance from piles after they
een dining-out, or have taken larger quantities of wine
usual. Hence the necessity for those who suffer from
al hæmorrhoids to abstain as much as possible from the
res of the table. Women in an advanced state of preg-
suffering from the irritation of piles should be very care-
out the condition of their bowels, and should keep the
ntal posture as much as possible.

en internal hæmorrhoids increase to such an extent as to
de at the closet, and produce considerable pain and
ing, greater precautions and more decided treatment are
ul. The bowels should never be allowed to become costive
to necessitate straining efforts; the protruded parts should
refully sponged with cold water, or with a strong infusion
assia or of decoction of oak-bark and alum in the propor-
of half a drachm of the salt to twelve ounces of the decoc-
, and should be carefully returned by the patient; or,
ead of these lotions, the gall-ointment may be smeared over

the piles with great benefit. The bleeding, w
annoying, may be checked by an injection of
and water, in the proportion of one to two gr
to an ounce of the latter; or, if necessary, a lo
the proportion of eight grains to an ounce, ma
must be borne in mind that a moderate amou
persons who live high, and whose vascular sys
beneficial rather than otherwise, and should
with; the popular notion as to bleeding
salutary is by no means incorrect, when applie
When, however, the hæmorrhage arises fro
pathological change in the tumour, such as ul
sive vascularity of the mucous membrane, and
continuous and goes on to such an extent as
the patient's health, producing a pallid face, a
irritable heart, it should be put a stop to.

A very common internal remedy for piles i
of black pepper, in the dose of a drachm twi
be given by itself, or, as I often use it, mixe
part of confection of senna. It is difficult
remedy acts; it certainly does good not only in t
it is highly serviceable in other affections of
especially in those cases where the wounds be
healing after the operations for fistula, or fo
anus.

From the close connection between the nec
and the rectum, it follows that the affection
viscus, together with those of the prostate gl
will influence the rectum much; and thus in
elderly persons, special inquiry should be directe
for not unfrequently hæmorrhoids and prolaps
will be found to be much aggravated, if not
violent straining efforts made in the difficult
water. If stricture exists, the urethra must b
there can be any hope of curing the piles; and
not any stricture, and yet there be a loss of
power of the bladder from debility or old age, th
be artificially emptied by the catheter.

When internal piles become inflamed and pr
the sphincter, the patient will suffer much both
stitutionally. He must be confined to bed, an
possible, should be carefully returned by the s

e a work of great difficulty from swelling and congestion,
s should be applied, and subsequently warm fomentations
oultices. Ice locally applied in a bladder is a valuable
to diminish inflammation and pain. Opium should also
en in full doses. An operation which may be considered
ble should not be put in force whilst the hæmorrhoids are
tate of active inflammation. Sometimes, as I have before
, the constriction of the sphincter produces sloughing, and
taneous cure takes place; if this is occurring, the process
be expedited by the liberal use of warm bathing and
cing, and pain must be conquered by the administration of
.

the adoption and right application of these remedial
res, a large proportion of cases of internal hæmorrhoids
e cured, or relieved to so great a degree as to prevent
ance; but many of the cases which come under the
of the surgeon have existed so long, have reached such a
nd are productive of such troublesome and even serious
oms, that some active surgical interference is required, in
to bring about a cure or render efficient relief. Originally
ual remedy in aggravated cases was the excision of the
ed part, and it was a remedy accompanied with little pain
iculty; but the danger of hæmorrhage proved to be so
that after the sacrifice of several lives the practice was
oned. It is necessary, even when the excision of external
s being performed, to take care that the mucous mem-
is not too freely clipped, otherwise dangerous bleeding
result. I saw a gentleman nearly lose his life from the
ion of a portion of mucous membrane in the blades of the
rs during an operation for external hæmorrhoids: the
tion was done at 2 P.M.; and at 6 I was sent for, and found
e had been bleeding profusely.

til within the last few years the radical cure of internal
rrhoids was effected by strangulating the tumour or
urs by means of one or more ligatures so tightly applied
in the course of a period extending from five to ten days
umours sloughed, and together with the ligatures separated
the bowel. Indeed even now amongst the senior members
e profession this operation is practised; and there cannot
doubt that, in the absence of a less severe method of treat-
that by the ligature was the best that could be desired,
was unaccompanied with the dangers which attended

upon the operation of removing internal hæmorrhoids knife or scissors, and was much more efficacious tha of treatment by strong nitric acid.

The operation is performed in the following man patient, who has previously had an enema of warm w thoroughly to bring down the hæmorrhoidal tumou kneels on an arm-chair, or lies on his side upon a b An assistant separates the buttocks, whereupon th lays hold, with a long pair of forceps or vulsellu tumour which is to be operated on. The assist traction with the instrument, so as to expose and tumour as much as possible. The operator then, by a well-curved needle set in a strong handle, passes thread of strong silk or twine through the base of and having cut the thread and removed the needle half of the tumour as tightly as possible. The e ligatures are cut off close to the knot, the protruded returned within the bowel, and the operation is finis better to notch the circumference of the tumour at where the ligature will fall before it is tied, as the will take place earlier: for this hint I am indebt Curling. If there are two or three distinct hæ tumours, each of them must be operated upon in the have described.

If there is much loose integument about the redundancy should be removed with the scissors. ought not to be taken away, as inconvenient contract take place; but the surgeon who understands his bu not be likely to fall into an error of this kind. If flaps of thickened integument which are so frequentl connection with hæmorrhoids are not taken away by th there is a probability that the cure will not be perfect. cases have lately been under my care where the lig been applied by various surgeons, and where the dis returned. In some of these cases the external folds o ment had not been removed, and I cannot help belie this neglect had been the cause of the failure of the op

The proceedings above detailed are finished in a few m If the patient is courageous and determined, I would operate without giving him chloroform; but if he is sensitive and timid, it would be better that he should inh as the pain in such instances may be very severe.

The patient must keep his bed for some days after the operation. A full dose of opium should be given the first night, so that pain may be prevented and the bowels be confined; if there be much pain about the seat of operation, ice applied in a bladder continuously will give great relief. Retention of urine is apt to follow this operation, and when present must be relieved by the catheter. It is desirable to keep the bowels quiet for three or four days, if possible, and then to obtain an evacuation by a dose of castor-oil. Very likely the ligatures will separate on the first action of the bowels; at all events they generally come away on the fifth or sixth day. Some pain is felt in the part for a few days afterwards, and during this time the patient should keep quiet: convalescence may be expected in a fortnight from the time of the operation.

This is the general course of things when the operation is successful and unattended with any evil results of any kind; but it is well known that the use of the ligature is occasionally followed by very serious results: and, indeed, several instances have been made public where death has ensued after this operation, the cause of death being effusion on the brain, tetanus, and pyæmia, the latter disorder most frequently. Several fatal cases have occurred in the practice of my own personal friends, and I have had the misfortune to lose two patients after the use of the ligature. One of these patients was a gentleman in the prime of life and very fair health, who died with well-marked symptoms of pyæmia; and in the other case, the fatal event was due to the loss of blood during and after the operation.

But besides the risk of death from some of these causes after this operation, it is known that other serious results occasionally follow and give much trouble.

Thus I met with a case of a lady who had lost much blood prior to the operation. I had to employ several ligatures, so that the operation was of necessity severe and prolonged, and it was followed by the most intense pain, so that, notwithstanding the employment of large doses of opium, frequently repeated, I was fearful that she would actually die from the effects of the severe pain she experienced, and which did not lessen until the ligatures separated, at the end of a week. After the subsidence of this, other symptoms manifested themselves, and caused great alarm, culminating in fact in a severe attack of phlegmasia dolens of the left leg and thigh, so that she was not enabled to leave the house to go out for a drive until a period of six weeks had elapsed.

In another instance which occurred to me not long after this, I employed ligatures for removing a mass of hæmorrhoidal tumours. The patient was a healthy middle-aged man, of temperate habits, living in the country; the operation was followed by most intense suffering, and subsequently by symptoms, very similar to those familiar to the surgeon under the traumatic delirium. These continued for some weeks, and at threatened to destroy the life of the patient; as it was, he was bro such a low state that he was unable to leave his house until a peri months had elapsed from the time of the operation.

A circumstance which occasionally obtains after th the ligature, and which causes great annoyance, is the e of long-continuing and painful ulceration at the seat o more of the ligatures, for a period varying from weeks to Everyone who has had much to do with this operati have met with such cases. These ulcerations are most to heal, and give great annoyance both to patients geons.

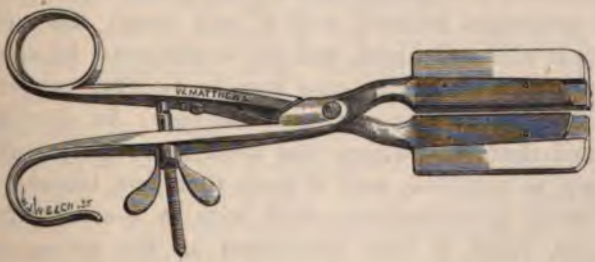
To sum up briefly then, it may be stated with tr there are the following objections to the use of the lig The supervention of more or less pain; a tedious conval occasionally death from pyæmia, tetanus, or general tional disturbances, and long-continued and painful ul at the seat of ligature.

It is the duty of the surgeon to adopt some other me has them in his power, by which these results may be o and by which the disease can be cured; and fortunat enabled to effect this by employing a mode of operatio is now being pretty extensively used, and which is well under the name of the operation by the clamp and caut which I will now proceed to speak of; but before de that modification of the operation which was introduce profession by myself, I must briefly refer to the history mode of treatment, which probably will almost entirely su the employment of the ligature.

As far as I am aware, this plan of treating hæmo tumours was originally practised by the late Mr. Cu Dublin, about thirty years since; but its introduction to surgery is, I believe, due to Mr. Henry Lee, who so lon as 1848 described a pair of forceps or clamp, which he to have used extensively; for in his volume of Path and Surgical Essays, published in 1854, he has narrate cases where he employed it, and applied either nitric the actual cautery for the purpose of arresting the hæmo after excising the tumours. In addition to the clamp nally used by Mr. Lee, and which was somewhat cumbe there was another kind of instrument, shaped somewhat like a pair of scissors and which was much more suited for the purpose.

In the year 1863 I first began to treat cases of internal hæmorrhoids and prolapsus by the clamp, employing, after excision, the strongest nitric acid for the purpose of obviating bleeding. I soon became convinced of the value of this mode of treating these disorders, but in a short time I found out that very great improvements in the construction of the clamp were called for, and, with the assistance of the late Mr. Matthews of Portugal Street, I introduced to the notice of the profession the instrument which bears my name and which is now generally used. It is shaped somewhat like the ordinary clamp used by Mr. Curling for the purpose of seizing and applying nitric acid to hæmorrhoidal tumours; but the blades are so constructed that they meet accurately at their edges, and are closely fitted into one another by means of a raised surface on one and a groove on the other edge. In this way, and if the blades are made perfectly parallel, the most perfect and accurate compression is made upon a tumour or portion of mucous membrane. A more important feature, however, in the mechanism of this instrument, is the adaptation of a light yet powerful screw to the shank of the instrument, just above the handles. The object of this is twofold—in the first place to compress the blades, and in the next to take off the compression after the actual cautery has been applied; and by the slightest turn of the screw, this may be effected so gradually, and yet so thoroughly, that should any vessel be left uncauterized, its situation can be at once seen by the issue or jet of blood, and the cautery can be reapplied.

FIG. 276.



The latest, and a very important addition to the instrument, consists in the adaptation of a layer of ivory to the outer surfaces and external edges of the clamp, so that the heat from the cautery cannot be transmitted to the surrounding parts, and thus much suffering is prevented.

I will now proceed to describe the mode of application of this instrument, and this description will apply both to cases of hæmorrhoids and prolapsus of the rectum.

In the first place, the part to be operated upon is made to descend either by means of an enema or by the patient sitting over hot water: the tumour is then seized by a pair of hooked forceps, and firmly held by an assistant. The clamp is now carefully applied to the base of the tumour, and the blades are closed by means of the screw. After having seen that this is done effectually, the surgeon takes a sharp pair of scissors and cuts off the whole of the tumour; the cut surface is wiped, and carefully and repeatedly touched by the heated iron until it is considered that the entire surface is thoroughly cauterized.

The screw is now gently turned, the grasp of the clamp is thereby somewhat relaxed, and if any vessel has not been sealed up it will emit blood, and the cautery can be again applied. Sometimes this process may be needful two or three times before the bleeding is quite stopped. As soon as it is ascertained that the surface has been thoroughly cauterized, the clamp is removed, and if more than one tumour exists, each of them is successively dealt with in a similar manner. The finger, oiled, is then introduced as far up as possible into the bowel, so as to push the parts well up and cause the sphincter to contract; a suppositorium of two grains of extract of opium is introduced, and the operation is completed. If only one tumour requires removal, the proceeding may be finished in a minute or two; but if there are several tumours, the operation cannot be safely or satisfactorily concluded under ten or fifteen minutes.

There are one or two points connected with the operation which demand attention. In the first place, the facility of the whole business depends greatly upon the extent to which the parts are exposed. If the tumours are well brought down outside the anus, the clamp may be applied very readily; but when the tumours are not thoroughly protruded, or are very small, it is very difficult to apply the clamp. In some instances where the skin of the anus and the mucous covering of the hæmor-

followed either the operation fc
And with the exception of on
had organic disease of the liver,
was divided, I have not been obli
ligature of any vessels after the a
have not met with any undue con
In one instance only some contra
but I had removed freely some
the use of a bougie for some ti
tion.

In two instances death follo
ference to the details will show a
each was a post hoc, but not pro

In the one instance the patient was
dreadfully from hæmorrhage for many
health that for some time before I saw he
and in this state the prolapsus came
returned. I was summoned into the cou
in such a feeble state, I, in conjunction w
best to relieve her of this annoying caus
clamp and cautery on January 26, 1868.
with loss of blood. On the fourth day, t
and so far as the actual operation went, it
attendant, 'very successful,' but she nev
been suffering, and died from exhaustion

In the second case, a lady between fift
in October 1868. She also had been suff
bleeding from internal piles, and when
wretched state from bloodlessness. The
loss of blood, and she was able to get
this day a favourite daughter suddenly c
the most violent state of hysteria, whi
coma, in which she died on the thirteen
local mischief about the wound, which wa
ascertained that a favourite son of this lady
that then she had a violent attack of the
that some latent disease of the brain exis
citement in her feeble state had lighted it

This operation is, I believe,
cases of severe hæmorrhoids or pr
or from the presence of some o
operation by the ligature would
danger. Thus in two instances of
by symptoms of paralysis, where th
annoyance, I did not hesitate to

each case the patients were advanced in life; and the operations were attended with as little disturbance as in perfectly healthy individuals.

In only one instance have I refused to employ the clamp, and this was in the case of an aged gentleman, to whom I was called by Mr. Cross of Petersfield, and who had a very large prolapsus. The patient was otherwise seriously ill with general debility, and some indications of cerebral mischief; and although the local disorder had evidently aggravated his condition very much, I quite agreed with Mr. Cross that it would not be wise to operate even with the clamp, and the wisdom of our determination was shown in a few days by the gradual sinking and death of the patient.

The advantages which I claim for this proceeding, which I now always adopt in cases of hæmorrhoids or prolapsus, are, that there is considerably less risk to life than when the ligature is used; that in the majority of cases the suffering both attending and following the operation is much less, and that the period of convalescence is rendered much shorter. It is true that the operation itself is complicated and somewhat tedious, as compared with that by the ligature, but these considerations ought not to weigh with the surgeon when the advantages of any particular proceeding are great and palpable.

Nitric acid was strongly recommended by the late Dr. Houston of Dublin as a means of getting rid of some forms of internal hæmorrhoids; and it is somewhat curious that, although his paper was published in the *Dublin Quarterly Journal* more than fifteen years since, and Sir W. Fergusson, in his *Practical Surgery*, soon afterwards drew especial attention to the subject, the use of the agent is still comparatively unknown, or at all events has not had that attention paid to it which it deserves. I have been in the habit of using the strong nitric acid in certain cases of hæmorrhoidal affections for many years. Mr. Henry Lee has incorporated with his Surgical and Pathological Essays an admirable paper on this subject, and has spoken highly of the plan of treatment which I am now about to consider.

I have stated, whilst describing the nature of internal hæmorrhoidal diseases, that the condition in which they are found varies. I have endeavoured to point out those cases to which an operation is applicable, and have stated that this practice is justifiable in those instances where the tumours are large, mainly composed of tissue in which the veins predominate, and have become indurated.

There are, however, other instances where the hæmorrhoidal

tumours are small or moderate in siz
evidently composed of morbid texture in
rather than the veins are interested, as
florid aspect, and by their tendency to
whenever the patient is at the closet, o
handled. These tumours are sessile,
prominent. They produce exceeding
prove most destructive to the health, a
great deal of blood. Now, in such
undoubtedly be as effective as in the
described; but this proceeding is not n
of the nitric acid is so eminently suite
which one single application of the aci
remarkable: and an excellent cure may
of the diseased texture be subjected to i

About this particular kind of case t
mind of any surgeon who has seen the
proper manner. There is, however,
where the remedy is an uncertain one, b
the surgeon is justified in trying it, and
succeeded when I little expected it.
where there is a hæmorrhoidal mass, c
tumour mainly composed of venous ram
colour, with one or more presenting th
sessile pile; or one portion of the t
present the dark blue appearance and t
another portion of it may be brightly
mucous covering granular or slightly
of mixed case I do not hesitate to try
is particularly desirous; but I make
it is impossible to depend upon any cu
case, although in some instances the
efficiently.

To apply the agent in those cases
large and indurated, and have a dee
perfectly useless, and only bring discre
as a means of cure in other kinds of ha

It is, however, in that class of cas
with, where there is not so much an
tumour, but where there is a congested
the mucous membrane of the rectum,
a greater or less extent, that the nitric

Dr. Houston has compared this condition of the rectum not inaptly to that of the thickened conjunctiva after long-continued ophthalmia. The application of the acid to the diseased points from which the bleeding proceeds will soon remedy all the bad symptoms.

The following is the mode of applying nitric acid:—The bowels having been well evacuated some hours previously, the diseased portion to which the application is going to be made should be well exposed by making the patient sit over hot water for some few minutes; or if this is not sufficient, an enema of water should be thrown up the rectum, and the hæmorrhoidal disease will be brought well into view. The part to which the acid is to be applied should then be carefully wiped with a piece of lint. The surgeon then dips the extremity of a small flat piece of wood into the nitric acid, and touches the diseased surface carefully with it. The part touched, and the neighbouring mucous membrane, is well smeared with oil, and the whole is returned within the orifice.

I can truly say that it has never occurred to me to witness anything like a fatal, or even a dangerous result, after having had a large experience of this remedy. In one case, of a patient who was most anxious to be cured by one operation, I applied the nitric acid much more freely than usual, and produced great suffering for two or three days, with the effect, however, of making a good cure. In another instance, I heard, but was not a witness of the fact, that copious bleeding followed the use of the acid. In a third instance, which occurred very lately, a young lady was treated with the nitric acid for a florid pile. Severe and unaccountable suffering was produced for many days. On making a careful examination at the end of this period I discovered a small ulcer situated at the posterior verge of the anus, and exquisitely painful; suitable remedies relieved the pain in a few hours. On enquiring more minutely into the particulars of this case, I have reasons for believing that this ulcer existed before I applied the acid, and that some of the caustic came into contact with the sore and produced the severe suffering.

I have now and then met with cases where retention of urine and some bleeding have occurred after the free use of the nitric acid, but never sufficient to cause me anxiety; and they are symptoms which are easily met.

It is not necessary to confine patients to their bed after the

acid has been applied; and this is
remedy is so desirable, many patie
nor inclination to submit to an ope
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Within the last few years sc
especially M. Chassaignac, have
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Paris: this is the occurrence of stric
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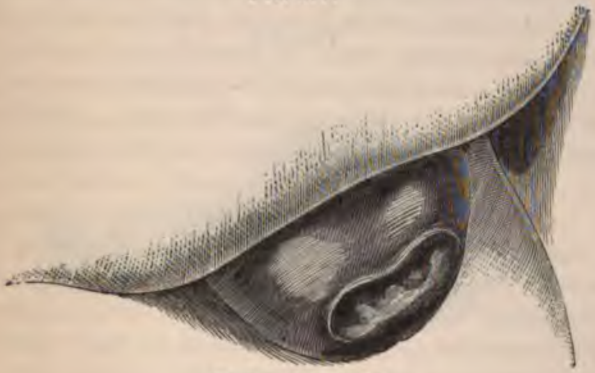
jection to the employment of th
counterbalance its real or supposed
it would not be wise entirely to d
for it must be rare, and in those fe
be required, the surgeon would do
to avoid the occurrence of contract

PROLAPSUS OF TH

During the time that the rectu
in a natural and normal manner,
bowel occurs; but this is only mo
action is finished, the mucous mem
drawn within the anal orifice an
When, however, from some partic
pediment to its return, those chan
the disease we are considering oc
becomes congested and swollen; its
tissue, naturally loose, becomes w
time the protrusion of the membr
stituting one form of prolapsus of t
frequent. In other cases, howeve
only of the mucous and submucou

of the thickness of the lower part of the bowel as well. A preparation in the Museum of King's College puts an end to all doubt on this point. This kind of prolapsus occurs not unfrequently in children, and is of great extent, the protruded bowel being sometimes five or six inches in length. In very old people this complete prolapsus of the rectum occurs, reaching to an immense size. On examining a recent case of prolapsus of the rectum, where the least amount of change has taken place in the structure of the parts, as for instance in a child, the protruded part is found to form a tumour of an oblong shape and cylindrical form, presenting externally the smooth vascular surface of the mucous membrane, which is generally of a more or less bright red colour, and covered with mucus; at the extremity of the tumour is the orifice or cavity of the bowel, and at the anus there is no deep furrow between it and the protruded part, as there is in the intussusception of the rectum. Even in the adult, when the prolapse is large and of recent occurrence, this mucous membrane may be as unchanged in appearance and texture as when it occurs in the child, but the tumour has more of a globular form.

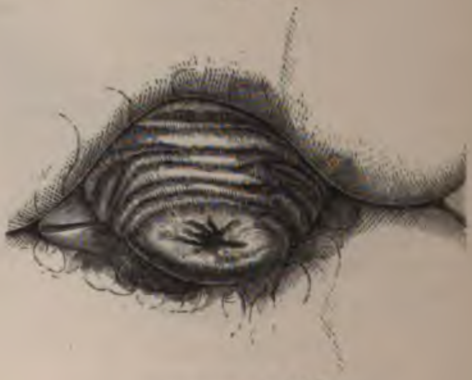
FIG. 277.



Prolapsus in Child.

The most frequent condition in which a prolapsus of the rectum is seen is where there are one or two lateral folds of the membrane, varying from one to two inches in length, protruded from the anus, or one unbroken ring of protruded membrane is seen—but this is more rare. If the disease has not long existed, the membrane is not much changed in appearance, being only somewhat thickened and more vascular than natural; but should the bowel have been habitually prolapsed for some years, considerable changes take place, and on examining an old case the following will be the appearances. Externally there will be a ring of thickened integument; within this the flaps of mucous membrane hang down, their lower portions being much thickened, having lost the peculiar character of mucous membrane, and being assimilated to integument; this change has taken place because the most dependent portion is that which either habitually remains protruded altogether, or is protruded for a longer time, and more exposed. On separating the flaps of the prolapsus, the upper part of the membrane is found either but little altered from its natural character, being red, smooth, and vascular, or superficial ulceration may have taken place where the two portions have been in contact. There is more or less mucous discharge produced, but in pure prolapsus there is little hæmorrhage.

FIG. 278.



Prolapsus in Adult.

Sometimes, in persons advanced in life, the protruded part consists of a tumour as big as the fist, which has habitually protruded for a long time. In such a case, a very large proportion of the tumour consists of membrane more like leather than the natural tissue. In these old-standing cases the sphincter becomes extremely relaxed, and the anus very capacious; there is generally a redundancy of loose and thickened skin around; sometimes it hangs down in long pendulous flaps—this state of the parts adds materially to the facility of the occurrence of the prolapsus.

In many cases the prolapsus of t
with distinct hæmorrhoidal tumours, w
not entirely, the originators of the af
more internal tumours exist, they t
bowels act, become protruded, and dra
membrane down with them; so that r
presents himself with one or more fold
and at the same time with distinct hæ

The inconvenience and suffering w
considerable, for although at the or
protruded part may pretty readily ret
after an evacuation, as time wears on
the patient himself to return the par
deal of difficulty, and attended with p
contiguity of the rectum to the neck of
there is often great distress of thes
bility, and even retention of urine,
of the affection; pain and uneasiness
down the thighs: the intestinal canal
order, the patient being troubled
appetite, and low spirits.

If the prolapsus cannot be returne
distant symptoms occur—extreme pain
of urine; and if unsuccessful atte
the swelling, which is in all probabili
the sphincter, violent inflammation of
severe constitutional suffering, occurs;
sloughing of the protruded bowel take
cure is brought about, but the misc
even death. In cases where a prolaps
great extent, and has been allowed t
three days, the local and constitutio
; the prolapsed membrane, howev
[illegible]

The causes of prolapsus are constitu
the disease is very frequently met with i
from general debility and laxity
especially the affection is met with in
which has been much reduced by insu
and want of proper attention. An a
much from prolapsus, usually has
and impaired digestion; and in

unhealthy and dry skin, a foul
local causes which produce falli
stone in the bladder, and asc
sedentary occupation, the strai
urethra, and enlargement of the
disease. There is no doubt, m
of frequently using copious e
ductive of the disorder.

In considering the treatment
shall first refer to that whic
affection as it is met with in yo
it is necessary to seek for its ca
be made with reference to the
frequently happens that it is th
bladder which produces the ex
be so, it is obvious that the re
the stone. If there be not sto
ascarides in the rectum may
destruction of these parasites b
calomel, together with the dai
strong infusion of quassia, will

In by far the larger proporti
the general health will be fo
attended to before the prolapsu
place, it is necessary to return
is sometimes a work of difficu
violently and cries. The protr
firmly grasped by the right han
as to empty the vessels, should
returned within the sphincter.
large, however, and the child i
fall again; and in this case the
the child under the influence o
be readily returned. A pad
employed in order to secure t
liver and bowels should be ren
doses of rhubarb and hydrarg.
order by the warm bath; the
the fresh air; the diet must be
and the strength and appetit
doses of the pulvis cinchonæ an
the prolapsus will cease to app

be bathed with a solution of sulphate of iron, gr.
f water; or an injection of tincture of sesquichloride
j. to ℥vj. of water, may be thrown up every morning
evacuation of the bowels, and after the protrusion has
rned. In some cases the prolapsus will recur when-
child evacuates. This accident, however, may be
l by so managing that the child should be in a kneel-
ure during the act. Another plan which sometimes
in preventing the protrusion, consists in an attendant
on one side the skin of the anus with some force during
the bowel is being emptied; by this means a certain
of temporary contraction is produced, which prevents
nt of the gut. In adults, a considerable number of the
ich are not severe, and which have not been of long
, may be cured by careful attention to the removal of
ses which have produced the disorder. Thus, if it has
from violent straining and constipation of the bowels,
ld aperient should be exhibited occasionally, which will
accumulation in the bowel, and render the contents
id. The compound rhubarb-pill at night will have this
r, what is perhaps better, one or two teaspoonfuls of
n of senna should be taken. The patient should not eat
and should especially avoid vegetables in any quantity.
ld take exercise, and be careful to use plenty of cold
the parts after the action of the bowels. Occasion-
tle cold water, or a few ounces of the decoction of oak
y be thrown up the rectum; and if there be the least
on left after the evacuation of the bowels, the gut,
irst been well sponged, should be carefully returned.

tention to these various measures a prolapsus of small
nay either be entirely cured, or be prevented from in-
or proving troublesome. And therefore it is of the
importance to place reliance upon medical treatment in
ses. In by far the majority of cases, however, which
ented to the notice of the surgeon, the prolapsus is
ery large, or has existed so long a time that medical
nt would be of no use whatever. And then some strictly
means must be adopted, if a cure, or even if palliation
isease, is looked for. If the case is of only recent occur-
nd yet the prolapsus be very voluminous and incapable
g returned, thereby causing much alarm and suffering,
e duty of the surgeon at once to reduce the prolapsed

bowel. This is best effected by
with his knees drawn up, and gr
the naked hand well oiled, or w
and steady compression should
tumour be returned within the
then lie quiet for some hours,
applied to the anus, and be sec
the perineum and around the
return of the prolapsus, the wh
mucous membrane should be sm
silver, previous to its being ret
remarkable case of immense siz
adopted this plan, with the resu
a bandage, which he continuall

In order to bring about an e
severe cases of prolapsus, more
We have seen that the disease
and thickened condition of the
ration, as it were, of this from t
is involved also, there ensues a w
whole of the thickness of the bo
ports. The object to be obtain
or relaxation of the mucous m
between the several tissues com
up the anus and the sphincter
was the first to propose a proce
result; and this consisted in re
flaps of skin which existed aro
the case alluded to by him in
Surgery, p. 443. In some case
relaxed, and the flaps of integ
may be brought about by the re
the prolapsus is very large, an
mucous membrane has become
ing to integument, it will be ne
of the operation proposed by
removing radiating folds not on
the anus, but also portions of t
This operation is effected by la
each side of the anus with for
pair of scissors removing both
In very severe cases four or six

be necessary; the operation is painful, but is soon accomplished; as the wounds heal, contraction takes place, the aperture of the anus becomes diminished and braced up, and the prolapsus no longer occurs.

It is important to bear in mind that, in very severe cases, not only is it necessary to remove the relaxed integument, but portions of the mucous membrane, which in instances of long standing has become converted into a tissue more like leather than anything else, must also be taken away: if this step be not resorted to, a disappointment will ensue as regards a complete remedy of the prolapsus. Hence the surgeon must think of the possibility of somewhat severe hæmorrhage, which will occasionally occur. After a portion of the mucous membrane, however small, has been snipped away, I have seen it occur to a very great extent, and when it was least expected.

If hæmorrhage to a large extent does occur after a surgical operation on the rectum, the patient will in a few hours complain of tenesmus, and express a desire to go to the closet; he will then evacuate a large quantity of blood, and become faint. In such a case it will be necessary to clear away any coagula which may be in the gut, to elevate the pelvis, and introduce some ice into the bowel. Should this not stop the bleeding, a careful examination should be made with a speculum, and the bleeding orifice be looked for and tied. Sometimes it will be difficult, or almost impossible, to effect this; and then the rectum must be carefully plugged by portions of sponge or lint, to which a thread should be tied, that the compress may be more readily withdrawn when the bleeding has ceased.

It may here be stated, that the risk of severe hæmorrhage after the mucous membrane has been excised may be in a great measure obviated by the surgeon taking care to introduce, through the edges of each incision, one or more fine sutures before the patient is left.

Another mode of curing prolapsus consists in the application of the ligature to portions of the prolapsed membrane. This plan is especially adapted to those cases where there is great laxity of the mucous membrane, and where the surrounding integument is not much involved; also to those cases where the prolapsus is associated with one or more hæmorrhoidal tumours. This operation was originally proposed for prolapsus by the late Mr. Copeland, who found it to answer his expectations most admirably. It is easily done, by pinching up, with

a pair of forceps, small portio
applying around each a tight thr
and returning the parts withi
distinct hæmorrhoidal tumours
undertaken for them, and descı
performed. As the prolapsus is
of the hæmorrhoids, the cure o
the disappearance of the former.

In either of the operations jus
certain amount of danger, and t
to bed and to the house for a
there is any other agent by whicl
without producing either the da
to bed, it should be adopted.
locally applied to some forms o
so well, has lately been used b
standing cases of prolapsus wi
however, only in certain forms c
will act beneficially. In the c
and of very long standing, whe
become very much thickened, aı
appearance, the acid will do lit
cases of simple prolapsus of th
more large folds of mucous men
extremely vascular, presenting tl
or is perhaps superficially ulce
strong nitric acid, applied carefı
portion of the diseased membr
should be used in the same m
cautions as when employed in
the entire surface of the prolaps
it, one application alone will sı
but it is better to apply the ac
or three operations may be nece
fully used, generally causes less
hæmorrhoids; for the mucous
long prolapsed, generally becom
when in its usual condition.

Cases of prolapsus are occas
very advanced age, or who are s
order which would forbid the en
bably there is, in conjunction w

nucous membrane, a very weakened condition of the sphincter, nd an abundance of loose and thickened integument around he anal orifice; consequently the use of nitric acid alone will ot suffice to remedy the disorder, even if the mucous membrane e not much altered in its character. In such cases I combine he use of the nitric acid with the removal of two, three, or our slips of the thickened integument from around the margin f the anus. The acid should first be thoroughly applied to the nucous membrane on one or more occasions; and after the apse of a few days the subsequent part of the treatment should e adopted by using the scissors in the manner before described. Most beneficial results will follow from this practice, and it may e undertaken without fear of danger in cases where the ligaure would not be justifiable.

Although either of these methods of treatment may be dopted with success, I now almost invariably remove a proapsus in the adult by the operation with the clamp and cautery, s in instances of hæmorrhoids, and in precisely the same nanner. If the tumour be small, it is only necessary to remove ne or two folds of mucous membrane; but if, as in some cases, t be very voluminous, it is needful to apply the clamp to everal portions of the protruded membrane. If there be great axity of the anus with redundancy of skin, two or three slips f the latter should be removed with the scissors, as in the peration of Dupuytren. I find this treatment is just as sucessful as when it is practised for the removal of hæmorrhoids.

In those cases where any operative measure is not advisable, reat relief may be obtained by the use of a pessary or spring ad.

FISTULA IN ANO.

The artificial communication between the cavity of the rectum nd the neighbouring textures denominated fistula in ano contitutes an affection of very great interest and importance, as here is a difference of opinion regarding the exact pathology; nd for the most part an operation more or less severe is equired for the cure of the disease.

Very opposite opinions have been propagated by eminent urgeons regarding the formation of fistula. Thus, it has been onfidently asserted by Sir B. Brodie that the origin of the isease was the existence of an ulcer in the mucous membrane, nd that the suppuration in the neighbouring textures was subsequent to and dependent upon other hand, it has been as confidentl the first step in the formation of thi tion and suppuration in the cellular t and that the abscess subsequently op the fistula was constituted.

There can be no doubt that the ways. We are acquainted with the ulceration of the mucous coat of the taneously and as the result of injury ulceration having occurred, some of escape into the surrounding cellular tion.

In the majority of cases of fistula formation of the disease is the exis cellular tissue surrounding the bowe the various textures are involved, pressed upon, the mucous and musc a greater or less extent, and at las penetrated.

It has been asserted that the corr pathology of fistula is of little con impossible to mention a surgical dis ful to know the steps of its format the malady, which must ever be loo tance than its cure, depends almost of the fact that in a great number side the bowel is the cause, and not

When suppuration has taken p around the rectum, and the matte cavity of the abscess commonly do probably of the periodical disturba by the action of the sphincter; an fistula, which, when it is perfect, mity with the bowel, and at the oth In consequence of the tendency in m little resistance, or where from positi burrowing takes place in various portion of the rectum, and several anus. In a great number of cases met with, and this is situated gener the circumference of the anus. In severe kind, where there has been extensive burrowing of matter, there are two or three openings situated at a greater distance from the anus—as, for instance, over the ischium or in the perineum—and the matter may even extend upwards, and open in the groin.

The external opening may present itself as a simple minute puncture, and when situated close to the anus may be so hidden between the folds of the integument as readily to escape observation, unless it be carefully looked for; the only thing which marks its presence being a slight moisture escaping from one point when pressure is made. In other instances of more extensive and old-standing disease, the opening or openings present themselves as somewhat prominent apertures, not unlike those seen in connexion with dead bone, and surrounded by more or less erythema of the skin, so that there is not the least difficulty in finding them.

Although for the most part it will be found that the external opening of a fistula is by the side of and some little distance from the anus, it is well to know the fact that sometimes it is so close to the circumference of the anus that it is necessary for the patient to protrude the parts well before this aperture can be discerned.

An external opening does not always exist, and then is constituted what the older surgeons named a blind or incomplete fistula. This form of the disease is somewhat rare, and it is very likely to be overlooked or misunderstood.

The internal opening of a fistula nearly always exists; and indeed, according to that view which looks upon the formation of the disease by preliminary ulceration of the mucous membrane, an opening must necessarily obtain; but there is no doubt that there are cases of incomplete fistula where there is no opening into the bowel; an examination on the living body alone might not be a sufficient proof of this, for the opening may exist, and not be ascertained; but no such source of deception can occur after death. There are three specimens in St. George's Hospital Museum, as well as two preparations in the Museum of St. Bartholomew's Hospital, which show this. On careful examination, however, it will be noticed that the mucous membrane of the rectum at the spot where the opening would have existed is very much thinned.

Formerly it was considered that the internal opening was situated much higher up than is really the case. Subsequent

oil should be given ; and after the bowels are evacu
wound should be cleansed and dressed again. A sma
of lint should be introduced from day to day within
of the wound ; and if it look flabby, a solution of su
zinc or of copper may be employed by means of the
the majority of cases, if there be nothing adverse,
made in the operation will heal up soundly in two
weeks. In some cases, however, without any apprecia
the healing process will be retarded ; a useful remedy
case is the confection of black pepper, in drachm d
night ; or it may be needful to send the patient away
of air, when the wound, which has hitherto become
will often commence healing again rapidly.

Before undertaking the operation for fistula, th
should take especial care to examine the patient,
locally, but as to the general state of health ; for this
not unfrequently complicated with other morbid sta
may either render any cutting operation unadvisabl
induce delay in order that some preparatory measur
adopted. Thus it is well known that fistula in a
unfrequently associated with pulmonary disease ; and
found to exist, it certainly would not be prudent to p
operation, unless the suffering from the local affect
be very great, and the mischief in the chest be v
If the fistula be cut when the patient is suffer
phthisis pulmonalis, the wound, in the majority of
not heal up, even though life may be spared for a co
time.

There are other cases also where fistula is me
persons who have had their health broken down
residence in hot countries, and have suffered from
and disease of the liver ; or cases are seen where eithe
or kidneys have become structurally altered by free i
in ardent spirits. An operation in such instances is
to be avoided, unless there be some urgent reas
adoption.

When a fistula is connected with a stricture of the
careful consideration of the case is required. If the o
be of a malignant nature, of course any operation is
thought of. It may, however, be somewhat difficult to
at the early stage of the affection whether the strictu
malignant character or otherwise, and the fistula in

with it may have been divided. In this case, either this wound will not heal, or its cicatrix will put on a scirrhous character.

I was called to see a middle-aged woman, who had been operated upon on two occasions for fistula, unsuccessfully, by a surgeon of large experience. On examination, I found that the wound had only partly healed, and had taken on a scirrhous character. On examining the rectum, I found that there was a firm indurated stricture, about an inch up, and there was much hardness about the parts altogether. I gave an opinion at the time, that it was a question whether the disease was not of a malignant character, although the features were not decided. At any rate, the ill success attending the operations for the fistula was due to the existence of the disease, which perhaps at the time was overlooked. I ascertained from a medical friend that this woman died six months afterwards, and that the disease had manifested itself as cancer.

If a fistula be complicated by a simple stricture of the rectum, and this latter be overlooked, the operation will in all probability fail. When the stricture is recognised, preliminary treatment is to be employed before the knife is used. The contracted part should be dilated by the bougie, and subsequently the sinus is to be laid open; during the after treatment, too, this use of the bougie must be strictly adhered to, otherwise contraction will recur, and the sinus will not close. When the inner opening of the fistula is situated above the stricture, this latter may be divided at the same time that the sinus is laid open; but it is better even in such a case to employ the bougie prior to the operation, if there be not any decided objection to this proceeding.

Every now and then a weakness or entire loss of power of the sphincter occurs after its division, more especially in those instances where two or three operations have been rendered necessary. In three instances which have lately presented themselves to my notice the operation had been repeated thrice in two of the patients, and twice in the other. In two out of the three the loss of power was complete; when it is but partial, recovery may take place after the parts are thoroughly and soundly cicatrised.

In some rare cases there will be an external opening on either side of the rectum, with only one inner aperture. It then becomes a question as to what should be done. The operation performed on that side where the inner opening exists, together with slightly enlarging the mouth of the sinus on the other, will sometimes suffice; but if this is found to be ineffectual, both the fistulous tracks must be freely incised. The objection to this double operation consists in the circumstance that loss of power over the sphincter may ensue. When is a complete fistula on both sides, a double operation m performed, and it should be effected on one occasion.

Ulcer of the Rectum and Anus.

The lower part of the rectum and the immediate circum of the anal orifice are subject to ulcerations, which are pe interesting and important, inasmuch as their existence tended with some striking phenomena; they are produ an excessive amount of suffering, and when careful judiciously treated are easily remedied. The various b of surface which are found involving either the mucou brane or the skin itself at the extremity of the rectum, al differing in regard to situation and size, have this one c feature, viz. acute sensibility. There are, perhaps, few in of morbid action so limited, producing such extreme and discomfort as painful ulcer of the rectum. The r obvious—it is the periodical action of the sphincter causes this great sensibility, independent of the usual of pain experienced from the presence of ulcerations exi the outlets of the cavities of the body, as for instance and urethra.

The simplest form in which these ulcerations are met that where there is a breach of surface at one or mor around the anus, not extending within the orifice; in case the entire extent of the mischief may be readily d if the patient be told to extrude the parts. On introdu finger into the rectum, the mucous membrane is felt to healthy; the patient complains of a smarting as the are passed, and the uneasy sensation or pain remains on few minutes, then goes off entirely: it is necessary to at this point very carefully in the examination of such a c by this means shall we be able to determine between t the ulcer which is seated within the sphincter.

These ulcerations are for the most part observed in who are not attentive to cleanliness, and more especially lower order of prostitutes, who have suffered from discharges; in all probability the mere mechanical con the gonorrhœal matter with the sensitive skin aroun anus, and its retention there, are quite sufficient to p the mischief.

The treatment necessary in such cases is, firstly, strict attention to cleanliness; the patient should be desired to apply warm water to the parts two or three times a day thoroughly, by means of a sponge. The solid nitrate of silver should be used once or twice to the ulcerated surfaces, and subsequently the application of the red precipitate ointment or of the lotio nigra will bring about a speedy cure. It will be necessary to attend to the state of the bowels; and the surgeon should not forget to inquire if there be any vaginal discharge; and should there be any, to put a stop to it by suitable injections.

The variety of ulcer next to be considered, and that which is more frequently seen by the surgeon, in consequence of the greater distress which accompanies it, is that where the ulceration is situated partly without the anus and partly within the rectum. The existence of this form of ulcer is not unfrequently overlooked, because, although the symptoms are peculiar and striking, the pathological change causing them is not readily detected, unless by one accustomed to look for it. The patient who is suffering from this form of the affection will complain of having what he terms the piles; on questioning him closely, it will be ascertained that there is not any protrusion, but that he feels more or less acute pain in passing the contents of the bowels. This pain, instead of diminishing, increases in severity after the act, and lasts for a considerable time, varying from a quarter of an hour to four or five hours; it then ceases, and there is no suffering until the bowels are again moved, when a repetition occurs; and as time goes on the symptoms become more severe. There is also in some cases a discharge of blood, and in all a more or less purulent discharge. On examination there will be nothing visible externally, with the exception, perhaps, of a small excrescence or pile about the size of a currant; and this is found in a large proportion of cases of ulcer of the anus and rectum, and is a sign of great importance. On requesting the patient to protrude the parts as much as possible, and separating the sides of the anus very carefully, the ulcer will be seen situated at the base of the little tumour, which in nine cases out of ten is at the posterior border of the anus. In one case the ulcer may be only the eighth of an inch in length, and its extent may be defined by the eye alone; in another instance it may be more than half an inch in length, and, extending beyond the verge of the anus, implicate the

mucous membrane of the rectum itself. When this is t
the limit of the ulcer cannot be seen, but it is nece
introduce the finger into the rectum, when the pecu
roughened sensation caused by the breach of surface i
detected by a practised hand. This introduction of th
is accompanied generally with excessive pain. The ul
be either round or oval. In one case lately under my c
was a peculiarity regarding this; for instead of there be
one external excrescence posteriorly, two existed, a lit
from one another, and an ulcer of considerable size
from the base of either of these tumours to within the s
narrowing as it encroached upon the cavity of the g
forming a complete triangle, with its base towards the
Instead of being so large as this—which is rare—the u
not be bigger than a large pin's-head or a small split-
surface is either smooth, the mucous membrane, when
verge of the anus is the seat, being simply denuded,
somewhat rough and excavated when the integument
implicated, and the appearance of the ulcer presents a
red or ashy-grey colour. In some cases there are tw
separated more or less by a raised process of integume
to become nearly distinct.

It is extremely important to employ the greatest car
investigation of these cases; for a small ulcer may b
overlooked, in consequence of the rugæ around th
enveloping the part and hiding it from sight. It
therefore, when this disease is suspected, to have a goo
and to take care that the examination be not made u
bowels have been well evacuated and the parts well c
With regard to the pathology of this affection, it is diff
come to any correct conclusion. In all probability some
of surface, at first slight, is produced by violent strainin
from the periodical movement of the part, and want o
liness and attention to the bowels, the ulceration increa
assumes the definite form in which it is presented to our
in other cases probably the commencement of the disea
sists in circumscribed inflammation and abscess end
ulceration, which is limited to the mucous membrane
respectively. In most cases the sphincter is found to a
strongly, so that considerable opposition is made to the en
of the finger when it is introduced for the purpose of ex
tion. This spasmodic condition of the sphincter ani is su

by some writers, as Mr. Copeland and Mr. Syme, to constitute peculiar affection; but it is doubtful whether the effect in uestion is not rather one of the prominent symptoms of an lcer at the orifice of the anus. There is good reason to believe hat, in all or most of these cases of spasmodic constriction of he anus, a diligent search would bring to light some slight lceration or excoriation, on which the symptoms depend. One f the most recent authors of repute, Mr. Quain, holds the view hat the sphincter is but secondarily or sympathetically affected, nd that the painful spasm is not a disease in itself.

I think, perhaps, that I have more frequently met with this ffection in women than in men; and most certainly they are ore liable to other morbid conditions which produce much the ame kind of symptoms as those afforded by the painful ulcer. Amongst these I may mention the displacement of the womb, which pressing upon the rectum gives rise to a difficulty and ain in defæcation; that painful condition of the coccyx which s the result of an injury, produces also very similar symptoms. saw recently a very marked case of this kind, where an minent physician-accoucheur considered that an ulcer of the ectum existed, whereas, on examination, no such lesion was ound, and appropriate remedies applied over the coccyx soon rought about a removal of the symptoms complained of.

The treatment of this affection consists either in the employ-
ent of local agents, or in the use of the bistoury. In those ases where the ulceration is only of slight extent, is not arried far within the sphincter ani, may be comprehended by he naked eye, and the symptoms have not long existed, a cure ay be brought about by careful attention to the bowels, by the mployment of rigid cleanliness, and by an occasional applica-
ion to the ulcerated spot of the solid nitrate of silver or ulphate of copper. After the sore has been touched once or wice, the effect will be, in those cases which are benefited y this treatment, a considerable mitigation of the severe pain which has troubled the patient when at the closet and afterwards; nd the sore, instead of presenting the greyish appearance hich is usually observed, puts on healthy granulations, and lowly contracts in size. In order to assist this process, a lotion f sulphate of copper or sulphate of zinc, one grain to an ounce f water, should be applied two or three times a day; or if these o not succeed, the ordinary black wash may be used with benefit. The daily introduction of a full-sized bougie, made of

wax or of yellow soap, will sometimes act benefici distending the sphincter, and producing such an am irritation as will set up a healing process in the sore.

In the more severe cases, however, this local treatn fail to produce a cure; and there are some persons w been brought to such a state of suffering, local and gen it will be unwise to trust to measures which either succeed, or which may be slow in giving relief. A mo of the operation which was originated by the French Boyer, and which consisted in the division of the sphi the tissues around, is now generally undertaken by surgeons, and is found to be successful in remedying t tion. The French surgeon and those who had adc operation were induced to make a complete divisio sphincter ani, under the impression that the muscular tion was the cause of the ulcer, and that the pathologi could not be removed unless the action of these fibres porarily destroyed. This severe operation doubtless s in bringing about a cure; but it was reserved for the Copeland to show that it is only necessary to mak incision through the ulcer or fissure itself without cu sphincter. Sir B. Brodie, Mr. Syme, and Mr. Quain advocated in their writings this limited operation; and almost universally acknowledged, that if the ulcer divided in its long axis, the same relief is produced a the sphincter was divided, and the operation itself is n severe and painful. The relief which is given to the p most remarkable. In a few hours the aspect of sufferin is so well marked in most of these cases, is almost removed; and even on the first evacuation of the bow the operation, the patient feels scarcely any pain bey produced by the raw surface of the wound.

The operation itself is simple and easy of executi bowels having been well cleared out previously by a castor-oil or an injection, the surgeon should then take a narrow-bladed, *probe-pointed* knife, and having passed forefinger into the rectum beyond the extremity of the should introduce the point of the knife very carefully, a mencing his incision above the ulcer, carry the cutti fairly and quickly through the centre of the sore or fiss is absolutely necessary to include the whole length of and not to cut to one side; and therefore it is well assistant should open the orifice of the anus as far as possible, in order that a good view of the greater part of the ulcer should be obtained by the operator. There is very frequently a small external pile or thickened fold of integument at the base of the sore; this should also be removed, as well as any other pendulous flaps of skin which may encircle the anus. Scarcely any dressing is required after this operation; a small strip of lint dipped in oil may be introduced, and kept in for a day or two, but it is not necessary. It is as well to give an opiate after the operation: in the first place, to lessen pain; and secondly, to prevent the action of the bowels, which should not be allowed for two days or more; and then this action should be produced artificially by a dose of castor-oil. The wound should be daily dressed with a dossil of lint dipped in a weak solution of sulphate of zinc and water. This dressing is not absolutely necessary; but there are some cases in which the wound becomes sluggish, and then a slight stimulation is desirable. The use of the confectio piperis nigri will assist the healing of the wound after this operation, as after that for rectal fistula.

Certain precautions and modifications with reference to this operation have been suggested by surgical authors: thus Sir B. Brodie has cautioned surgeons not to make the incision towards the vagina in the case of a female, for fear of the occurrence of loss of power over the sphincter vaginæ; others have suggested that the incision should be made on either side of the anus, in order that the sphincter muscle should be effectually divided: but now that it is not found necessary to do more than simply incise the ulcer, and in the most severe cases only to divide some of the fibres of the sphincter, the surgeon need not obey either of these injunctions, but be content with making a fair incision through the diseased part, wherever it be situated. The posterior part of the anus is found to be the seat of the affection in by far the majority of cases; sometimes the ulcer is found on one side, and very rarely it is seen on the anterior aspect; thus, out of twelve cases which I have recently met with, the ulcer existed in front only in one instance, whereas in all the others the disease was seated behind. It is very necessary to make a careful examination of the rectum at the time of operating, for it is very possible that a polypoid growth will be found to exist in conjunction with and above the ulcer, and which may easily escape observation. I have quite accidentally discovered these growths more than once lately after I had completed this operation and suffering is produced by this very slight disorder; it is not difficult to account for it, considering how extremely susceptible some persons—especially females, in whom this condition of the anus is mostly observed—are of painful impressions.

The treatment to be adopted in such cases is, in the first place, to endeavour to procure regular and healthy evacuations of the bowels, and to use scrupulous cleanliness after the motions. A considerable number of persons who suffer from this affection are those who sit a great deal. This should be avoided as much as possible, and plenty of exercise should be taken. The application of the solid nitrate of silver on one or two occasions will sometimes cure the disease; or a lotion composed of from four to ten grains of the same to an ounce of water may be applied to the part carefully by means of a camel-hair brush every other morning. The ointment of oxide of zinc, or one containing chloroform, will sometimes be equally useful in allaying the irritation and healing the part.

If, however, as will sometimes happen, none of these measures succeed in giving relief, and the patient suffers from continued distress after the evacuation of the bowels, an incision should be made through the fissure; the part will subsequently heal, and the troublesome symptoms disappear.

STRICTURE OF THE RECTUM.

Like other mucous canals, the rectum is liable to a contraction of its cavity; and although this disease may not be considered to be one of very frequent occurrence, it is by no means rarely met with, several cases generally presenting themselves annually at the various public institutions.

The disease consists essentially, in most cases, of an adventitious deposit thrown out upon or around the coats of the intestine. In the most simple form of stricture there is a more prominent ring of apparently hypertrophied mucous membrane, either entirely or only partially surrounding the cavity of the gut. A careful examination on the living body with the finger, and an investigation of the diseased part after death, shows that the thickening is produced in the areolar tissue underneath the mucous membrane; although there are preparations to be met with which lead to the belief that the encroachment upon the cavity of the gut is caused merely by a prominent fold or ring of the mucous membrane itself. In the more marked cases of

the disease, not only is the dep
cellular tissue, but there is a thi
as well, produced, not by hypert
by an infiltration of the fibrous e
of the muscular texture. In the
disease has lasted for a long perio
more extensive and dense. In
with a very narrow contraction,
of the coats of the bowel; but ev
able amount of contraction is
scarcely any, consolidation of the
very interesting preparation in the
Hospital, there is a tight contra
inches from the anus, the cavity
quarter of an inch in diameter fo
there is not any thickening of t
contraction is supposed to be ow
some rare instances, the stricture
in the walls of the gut, but by fib
cavity of the bowel; thus, in Kin
curious specimen, which shows a
a half from the anus, consisting o
of thick bands running across, in
tinct openings which would each

In a few instances the fibrous d
ing—which is the essential fea
only a portion of the circumferen
in a case of stricture of the rect
consultation. In by far the great
circumference of the gut is im
which has taken place. It may
side than another.

The extent of bowel affected
The disease may involve only one
more frequently the deposit ext
inch and a half in length; some
cates three or four inches of the
there is a general thickening of t
whole of the rectum, and produc
in the cavity of the bowel.

The pathological changes which
of the rectum affect the bowel i

behind it; important results are also witnessed in the tissues surrounding or in connection with the bowel.

The intestine immediately above the stricture is, in the majority of cases, more or less dilated; in one instance the cavity being widened only to a small extent, whilst in another, where the stricture has been very tight and of long duration, the intestine is distended in a great degree; thus in one specimen in the Museum of Guy's Hospital, the rectum is five inches in its diameter. There is also a thickening of its tunics above the part immediately diseased, in a great measure owing to an increase in the development of the muscular coat; the law being followed here, that if there be any obstruction to the passage of the contents of a muscular organ, the increased energy necessary will be marked by an increase in the size and strength of the muscular fibres. The mucous membrane above the stricture is generally in a diseased condition, being either preternaturally vascular and thickened, or, in long-standing cases, superficially or deeply ulcerated, and sending forth a copious unhealthy discharge. Below the seat of stricture there is not much alteration of the parts; the mucous membrane is, however, sometimes found to be inflamed and thickened, or even ulcerated; and there may be thickening and induration of the coats of the intestine, the result of inflammation and suppuration extending from the immediate locality of the stricture.

In addition to these morbid phenomena, which are usual, other serious changes are occasionally seen in connection with stricture of the rectum. Thus the irritation of the disease may produce inflammation and suppuration in the tissues surrounding the bowel; one or more abscesses may form, and communicate not only with the bowel at separate points, but open upon the surface near the anus, or in the front of the perineum. Sometimes a communication exists between the rectum and the vagina or the urethra, and more rarely an aperture forms above the stricture, between the bowel and the cavity of the peritoneum.

The connection between stricture of the rectum and fistula as one of its results is an important one; the two diseases are by no means unfrequently met with together. It is supposed by some authorities that the fistulous opening in the bowel is generally seated beyond the stricture, and that the morbid change is owing to the obstruction and subsequent mischief produced by the stricture; whilst others, among whom is

Mr. Syme, are of opinion that the fistulous opening is not
to the resistance which is offered by the stricture. It is
however, that the opening is not unfrequently found behi
stricture, and that sometimes it is situated lower down.
preparation lately inspected by me, where fistulæ were ass
with a stricture of the rectum, there was an opening i
bowel above the obstruction, and one situated below th
ture. In another specimen, a fistulous sinus runs up al
side of the gut for half an inch above the stricture
patient lately seen by me, where the two diseases we
ciated, I found, on examination, that the fistulous sinu
into the bowel just above the stricture. In some of th
there can be little doubt that ulceration of the muco
brane is the first step in the formation of fistula; w
others suppuration in the surrounding cellular tissue, a
sequent formation of the sinuses, is the correct patholo

With regard to the seat of stricture of the rectum, it
that one particular locality is more disposed to the dise
another. Thus in by far the majority of instances t
traction is met with at the lower part of the rectum, a
inch or an inch and a half from the anus. Observa
the living body proves this; and the result of my exan
of the morbid preparations in the various museums was
that, in very nearly one-half of all the specimens, the s
was found to exist at a point about an inch distant f
orifice. Next in frequency to this part, the disease is m
at a point varying from two to three inches from the a
is occasionally met with at four or five inches; and so
the contraction involves that part of the gut which ma
junction with the sigmoid flexure of the colon.

The symptoms which are produced by a stricture
rectum vary according to the extent and peculiarity
disease. In some rare cases, even when the obstruct
lasted for years and has materially narrowed the canal,
the usual symptoms referable to this disease have bee
rienced until a short period before death, or an exan
after death alone has revealed the true nature of the
Usually, however, there are well-marked symptoms.
instances the patient can trace the commencement of his
to a particular time, when he will inform us he suffer
or less severe and persistent pain in the lower part of th
men, which was followed by great irregularity of the

necessitating the use of aperient medicine; diarrhœa has probably supervened, the motions being tinged with blood; and this has been followed by constipation, preventing almost entirely the natural action of the bowels.

As the disease advances, the constipation increases, and there s a sense of obstruction about the rectum, which causes the patient to strain violently whilst at the closet; the fæces are passed in small quantities at a time, and are much diminished n size, as the bowel becomes more contracted; the general health begins to suffer from the retention of fæcal matter in the ntestines; the abdomen becomes distended; there is marked dyspepsia, with a loaded tongue and general lassitude; and the patient loses his natural appearance of robustness. The local symptoms also become more severe: there is a continual uneasiness about the rectum; considerable pain attending the passage of the fæces, which is effected two or three times in the twenty-four hours, in a liquid form; the bladder becomes irritable; pain is felt in the loins and down the thighs. Occasionally, a large accumulation of fæcal matter having taken place above the stricture, there will occur suddenly from time to time a violent attack of diarrhœa, followed by the most obstinate constipation. In advanced cases, one very troublesome symptom consists in the excoriation and ulceration which is produced around the anus by the acrid discharge which takes place from the seat of the stricture. In some cases this discharge is very abundant at the time the patient is at the closet, and is one of the most important diagnostic symptoms.

Although the general health in many cases of stricture of the rectum does not suffer much at first, the disease will, if unchecked, destroy life gradually by the local irritation and suffering, and by the impairment to nutrition almost surely following from constant and long-continued obstruction to the passage of excrementitious matters. In other cases the patient dies suddenly, from symptoms of acute obstruction and inflammation of the bowels, the strictured canal becoming blocked up either by an accumulation of hardened fæces, or by some foreign body. In one remarkably interesting preparation in the Museum of the College of Surgeons, a stricture of the rectum which had existed for years had suddenly become entirely closed, lymph being produced by the irritation of a fishbone which had been swallowed, and which had become arrested at the contracted part.

When the stricture is situated, as it usually is, within t inches of the anus, it is readily felt by the finger, which shou be well oiled and carefully passed, because in many cases gr pain is experienced by the patient. When the stricture is l slight, involving a small extent or a portion of the circumfere of the bowel, the diagnosis will not be so easy as is imagin when, however, the stricture, as is for the most part found, encroached on the cavity of the rectum to some extent, the fin readily detects it; for its point becomes entirely arrested by dense and hard obstruction, or it can only be just insinua through the diseased part. When withdrawn, the finger is ge rally covered with a muco-purulent secretion, if the case is a advanced.

If the symptoms are well marked, and yet the finger ca reach the obstructed point, it will be necessary either to m the patient strain violently, or to examine him whilst in upright posture; in this way a stricture which is situ beyond the reach of the finger in an ordinary examination, be discovered. Should this fail, a wax or gum-elastic bo about as large as the adult forefinger, and well oiled, shou carefully introduced up the rectum. This measure, howev rarely necessary for the mere purposes of diagnosis, and is to several sources of fallacy.

In making an examination of the rectum, the surgeon bear in mind that it may be pressed upon by bodies extern the bowel. An abscess of the prostate gland, especially if chronic nature, will so press upon the rectum as to contrac cavity and prevent the passage of the contents of the bowe

Latterly I had a patient at the Westminster General Dispensary, twenty-five, who applied with symptoms of obstruction of the bowels; n had passed for a week, and he was in continual suffering, and had becom much reduced in health. On examining the rectum with the finger, I that the cavity of this gut was almost closed by a large elastic tumour si in front. The patient had not had any gonorrhœa, but about a month s catheter had been introduced, and had caused severe pain and bleeding. then he had complained of pain and weight about the rectum, and the c pated condition of the bowels alluded to had occurred. I suspected that must be a chronic abscess mechanically preventing the passage of the and therefore passed a bistoury into the bowel, and made a free incisio the tumour; a large quantity of matter was evacuated, with great relief. patient was ordered a dose of purgative medicine; this acted freely; a symptoms of obstruction soon passed away.

The enlarged prostate itself in old people may so press the rectum as nearly to obliterate its cavity; the uterus may be retroverted, or a solid tumour growing from that organ may so press on the bowel as to cause the symptoms of stricture. We have seen that the essential pathological feature in stricture of the rectum is a fibrous deposit in or between the tissues of the bowel; and there can be no doubt that the chief instrument in the formation of this product is inflammation of the coats of the intestine of a more or less chronic character. The causes of the inflammation leading to the formation of stricture are various: spontaneous inflammation of the mucous membrane may arise; or the habitual presence of hard fæcal matter, exciting frequent attempts to evacuate, will produce it; foreign bodies lodging in a portion of the rectum for a continuous period will bring about the same result. Muscular contraction may cause stricture. I have alluded to one specimen where this, with very good reason, is supposed to have been the cause. Some of the most severe instances of stricture of the lower part of the rectum, or, more properly speaking, of the anus itself, are produced by the cicatrisation resulting from wounds made by the scissors in the removal of external piles, especially if the precaution be not taken to excise only the superabundant textures.

Sometimes, in these operations, large portions of skin, as well as circular fringes of mucous membrane, are cut off; the consequence is, the formation of a tight contraction at the anus. I met with an instance of this kind in the person of a lady who had been operated upon for external piles by one who did not understand his business. Such a tight and unyielding contraction occurred as nearly proved fatal; and the only manner in which life could be rendered at all comfortable was by passing a bougie daily, for the patient would not permit me to divide the stricture.

A by no means infrequent cause of stricture of the rectum is ulceration of the mucous membrane of the bowel, terminating in cicatrisation and subsequent contraction of the cavity of the intestine. This is occasionally witnessed in those persons who have lived a long time in India, and have suffered from dysentery. Direct injuries to the bowel will produce stricture, such as the operation for fistula, or the infliction of a wound by means of a bougie or an enema-pipe.

There is one cause, however, of stricture of the rectum which is almost entirely overlooked by the majority of writers, in this country at least. I allude to the venereal poison. As a direct consequence of the application of the poison to the part by

means of unnatural intercourse, it
in England; but as one of the seq
of the indications of constitution
unfrequently met with. Indepen
well-marked cases of stricture of
spectable married women, who
constitutional syphilis, have latel
either case the disease distinctl
poison had been received into the
informed me that he has lately s
syphilitic stricture of the rectum.
that he had a case in King's C
could be no doubt that the diseas
intercourse. Bushe, in his valu
ulceration of the rectum may aris
the venereal poison; or it may
the genital organs, and then co-
symptoms.'

The treatment of stricture of t
upon the same principles as ob
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cure, in the full sense of the wor
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increase, and thus ward off those
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The great object the surgeon
contraction, and to restore the c
possible to its natural condition.
be effected by the employment of
those cases which are situated wi
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bougie, or some other mechanical
stricture as a dilator. The boug
used is either made of wax, of gu
As, in the treatment of strictures o
prefer particular kinds of dilato
stricture of the rectum, although
be as useful as another. The wax
instrument in the slighter forms
where much pressure is not requi

nploy in cases where considerable pain is experienced on the ıtroduction of the finger, or where, from the existence of ıuch muco-purulent or sanguineous discharge, ulceration of ıe mucous membrane is suspected. It is important to be very articular in cleaning bougies after use. The gum-elastic ougie is the one perhaps which is most generally useful when ell made. It is sufficiently firm to compress the stricture ell, and yet elastic enough to yield to any obstruction through hich it is not intended to pass. The metallic bougie, which a short cylinder attached at pleasure to a handle, is especially seful in narrow strictures attended with a large amount of ıduration and situated close to the anus.

Before any attempt is made to dilate a stricture, it is neces- ıry to make a very careful examination, so as to ascertain the cact position and the nature of the stricture. In this manner ıe surgeon is enabled to ascertain pretty accurately the size of ıe bougie which should be employed—a step of importance, thereby the patient is saved much unnecessary probing, and ıe bougie is passed into the stricture with more facility. If ıe point of the index-finger cannot penetrate the obstruction, bougie smaller in size than this finger should be well oiled ıd gently passed along to the face of the obstruction. A very ight amount of pressure will generally cause the bougie to netrate the contraction. If it is held tightly, the instrument ould be left for half an hour; if, however, the stricture adily yields, a size larger should be passed.

The effect of this operation must be watched, and if no undue ritation be produced, a bougie of somewhat larger size may introduced on the second or third day, and be repeated at ıe same intervals, until as large an instrument as the anus n admit is passed without difficulty. In those instances of ricture where there is but a slight amount of thickening of ıe coats, the rectum may be dilated almost to its natural libre in a short period; but when there is great induration of e tissues around, and when the diseased part is exceedingly nsitive, the progress of the case will be slow, and attended th delay and difficulty. The patient may complain of great in when the bougie is passed through the stricture; and its e may be followed by local and constitutional suffering. If e stricture is very sensitive, the wax bougie should be used, d the size increased very slowly. When the instrument is thdrawn, a suppository of opium should be passed into the gut beyond the stricture if p sit in a hip-bath, and remain afterwards.

By taking these precautions rectum, which at first sight wc to treatment, will be brought i than is imagined. This will instances where the patients some cases where the act of followed by much pain, it patient to bed; but in those suffering produced, this step is

It is a very important matte tion, to attend to the state of lation above the stricture. In the bougie is commenced, to exhibition of castor-oil intern of warm water; and whilst th the action of the bowels mus condition as possible by the measures.

When the stricture is seated the use of the bougie is attend is no certain guide to the exact the size of the instrument w great care, however, the surge is situated several inches beyo must be borne in mind, that tl minence of the sacrum presen may be mistaken for stricture. should be taken not to do m that in several cases the walls by the bougie even where ther existence.

It has been stated that, in the rectum, there has been a ve be pretty clearly made out, the l by the exhibition of small doses sium; the general health will b a more speedy absorption of t the stricture. It will be well a the bougie with the strong mer ncision of the strictured portion has been practised by some geons; and, as an adjunct to dilatation, it is, in certain tances, a useful means. It is not, however, free from danger. ase came under my observation a short time since, in which th ensued upon the division of a stricture with the knife, l several similar cases have been recorded. This procedure, refore, should not be adopted unless there is a necessity it.

Incision is necessary in those cases of stricture, rarely met h, which are of traumatic origin, and situated at the verge the anus, or within a very short distance; there is generally ense cicatrix and much induration around, so that dilatation the bougie is painful and difficult. It is also advisable, if t actually necessary, in old-standing instances of the disease uated in the usual locality and arising from the usual causes, t where, from neglect and continual irritation, the induration und has become excessive, and the stricture most unyielding the bougie. In either case the operation is best done by roducing the left forefinger into the rectum, and guiding on that a straight, blunt-pointed, narrow bistoury, with ich the stricture is to be divided. Deep incisions must not made, but the stricture should be simply notched at several ints of its circumference. A bougie should be introduced mediately for a minute or two; a suppository of opium is en to be passed into the rectum; the patient must keep quiet two or three days, when the bougie is to be employed, and ntinued at regular intervals. In this manner a stricture ich previously had defied all attempts to dilate it, will be so reduced that the patient may obtain great comfort.

A stricture of the rectum when once fully formed, is seldom never thoroughly cured, even under the most assiduous care. ere is the same tendency to re-contraction here as in instances stricture of the urethra; therefore, when the disease has en brought under subjection, it will be absolutely necessary keep up periodical dilatation; this may, however, be easily ected in the majority of cases by the patient himself. In me cases once a week will suffice; where, however, the disease s been traumatic, it will be needful to pass a bougie every day, every other day, to prevent re-contraction.

If sudden obstruction of the bowels should happen to a tient suffering from stricture of the rectum, it will in probability depend upon some great contraction having

occurred, or upon the presence of a foreign body impacted
strictured portion. A very careful exploration is, therefo
be made with the finger, when the condition of the part
be ascertained. Sometimes it will be found that the str
has become so narrowed that nothing larger than a quil
be passed into it. Under these circumstances it must b
tiously incised, so as to allow of the introduction of an e
tube, by means of which injections are to be thrown up f
purposes of emptying the bowels. If a plum-stone or
other foreign body is found to be blocking up the cont
orifice, it must be dislodged; and this may be effected eit
the introduction of the finger, or by the use of a pair of fo
which are to be carefully passed through the strictured p

When sudden obstruction of the bowels takes place
instance of stricture of the rectum situated high up beyo
reach of the finger, the patient is placed in the most form
danger, for it is impossible to ascertain the nature
obstruction. I have referred to one preparation in the M
of the College of Surgeons, showing a stricture of the r
situated near the colon, which had become suddenly clo
an effusion of lymph, the result of a fish-bone sticking i
stricture.

In such cases the long tube must be carefully passed
the obstruction may be overcome; a large quantity of
water should then be thrown up. If, however, it is found
the tube cannot be passed, and the use of powerful purg
is of no avail, death will be imminent; and the only cha
obviating it will consist in making an opening into the
either by the method adopted by Littre in the groin, or
suggested by Amussat. The latter operation is that whi
usually selected; there are a few cases on record where lif
been preserved, and there are instances in which the surge
undoubtedly justified in resorting to this expedient.

CANCER OF THE RECTUM.

In considering the subject of stricture of the rectum,
form of the disease only has been alluded to which is the r
of simple inflammatory thickening: there is, however, ano
condition, where more or less obstruction to the calibre of
bowel is produced by growths which are essentially
malignant character, whereby the constitution is contamin

and which render the local disease much more formidable than the simple stricture. The features of distinction between these two particular kinds of the affection are generally pretty broadly marked, and, indeed, cannot well be confounded, when the one we are considering has become fully developed.

Cancer may attack any part of the rectum, but it is perhaps most generally met with in the lower portion; so that in a large number of cases the disease is within the reach of the surgeon's finger, and its character may be readily appreciated. In the very early stage of the disease it appears to commence as a hard deposit between the coats of the intestine; the deposit in some instances consisting of distinct nodules scattered here and there over the bowel; in other cases there will be a complete circle formed by the disease. The actual seat of the deposit is in most cases the areolar tissue, between the mucous and muscular coat. As the disease advances, this is more distinctly ascertained by the circumstance that the mucous membrane, in a more or less healthy condition, is raised up by the deposit underneath it; in course of time, however, this membrane becomes ulcerated, generally in the centre of the deposit.

In more rare instances the malignant deposit is situated between the muscular and serous coat of the bowel, and the morbid growths penetrate into and between the fibres of the muscular tissue. A general thickening and induration of the whole structure of the bowel takes place, so that when a section is made it is impossible to distinguish one texture from another. By this means the cavity of the bowel becomes encroached upon, much in the same way as when the simple fibrous thickening takes place.

As time advances and the cancerous growth increases, the cavity of the intestine becomes encroached upon to a greater extent by the formation of one or more tumours, or nodules, which project into the bowel; by-and-by ulceration of their surface takes place, and in some instances there will be found blended together a large hard nodule of cancer, and a distinct fungous growth with a bleeding ulcerated surface. The morbid growths increase upwards and downwards, and involve the rectum to the extent of four or six inches, and spread towards the orifice of the bowel, and appear there as warty growths or masses of fungoid disease. It not unfrequently happens, however, that there is a small portion of the bowel perfectly healthy between the anus and the deposit.

The same feature which is associated with malignant d
elsewhere is noticeable here, viz. its power of diffusion
attacking neighbouring parts; and this is one reason why
of the rectum especially is such a distressing malad
examining specimens of malignant disease of this bowel,
has advanced so far as to terminate life, the surro
textures and neighbouring organs will be found much a
In one case the uterus or vagina, in another the b
prostate, or urethra, has become involved in this ma
action, or subsequent disorganisation. A by no means
quent result of the mischief in the male is the formatio
artificial opening in the base of the bladder or urethra,
escape into and blocking up of this canal by fæcal matt
some instances the ulceration penetrates the coats of the
and opens into the cavity of the peritoneum; whilst in
there may be a communication between the bowel an
more distant parts, as for instance the hip-joint.
examined a preparation of scirrhus of the rectum,
about two inches from the orifice; there was a fistulou
ing above the stricture, communicating distinctly
abscess of the hip-joint. In some cases the ulceratio
takes place as the result of the extension of the diseas
marked; whilst in other instances there is slight ulcerat
an enormous amount of thickening of the coats and
together of the various parts around. Sometimes the c
the pelvis is found to be almost entirely filled up by
mass of malignant disease, originating in the bowel. I
cases the peritoneum is thickened with the cancerous
the omentum also may be loaded with it, and the liv
have malignant tumours scattered through its texture.

All the different varieties of cancer are seen to inv
rectum; of these, however, the true hard scirrhus is th
frequently met with; next to this, perhaps, the fungoid
is more often found. Specimens of epithelial and colloid
are more rarely, but occasionally, seen.

The symptoms which attend upon malignant disease
rectum vary much, both according to the stage of the
and the particular effect the deposit has upon the cavity
bowel. At the outset the patient complains of an une
about the lower part of the bowel, and an interruption
proper functions; the fæces passing with more difficult
heretofore; diarrhœa occasionally intervening, accom

with bloody mucus, and this latter symptom becomes more and more prominent. Thus at first the symptoms are those which depend upon ordinary stricture of the rectum, and the more especially as in some instances there is very little disturbance of the general health. As the disease advances, however, there comes on a greater difficulty in voiding the fæces, the act is accompanied with considerable pain, and at each time the bowels are moved there is a discharge of blood. As in ordinary stricture, there is great distension felt, which is now and then relieved by a profuse diarrhœa.

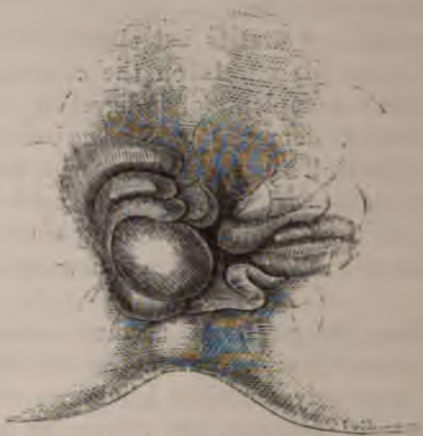
The general health at first is but slightly affected; but as the disease advances, its effects on the constitution become marked; the patient complains of indigestion and flatulence, and of an indescribable depression. His face becomes anxious—presents the peculiar dull aspect of one suffering from malignant disease; and emaciation takes place. The patient is deprived of rest; and indeed there can be few more pitiable objects than some of those who are suffering under cancerous disease of the rectum.

In course of time, the gut becoming more narrowed, and the surface of the diseased textures getting into an ulcerated state, there ensues of necessity a greater hindrance to the passage of the fæces; painful attempts are constantly made to pass them, and these efforts are accompanied with an acrid sanious discharge, mixed with fæculent and muco-purulent fluids. And frequently this action comes on without the patient having the least control over himself. As the disease involves the surrounding tissues, abscess forms by the side of the bowel, and degenerates into fistula. And when the deposit encroaches upon the bladder, there is either great irritability of that organ, or daily retention of urine; this latter symptom may be produced by the impaction of fæcal matter in the urethra. I have lately seen a preparation where a fatal retention of urine proceeded from this cause.

Death generally follows this disease within three or four years after its symptoms are marked. And it is produced either by a gradual sinking of the powers of life, or by the sudden coming on of an attack of obstruction of the bowels.

When the disease has existed for some time, and is not situated high up in the bowel, the surgeon can have little difficulty in forming a correct diagnosis; and in many cases there is more or less scirrhous induration at the orifice of the anus, or the disease protrudes externally in the shap fungoid mass. In the early stages, however, it is not e recognise the true nature of the malady. If the grow within the reach of the finger, it will be felt as an ind ring, encircling, or partially encircling, the bowel, as w simple stricture exists; but in the scirrhous disease the ness is much more decided and more extensive, the dis

FIG. 279.



Cancerous growth, protruding at the anus, surrounded by external pil

also is of a more offensive and sanious character than i the earlier stages of the simple stricture. It may, ho be difficult notwithstanding to ascertain the true nature malady at its outset; therefore a cautious opinion m given.

I saw, a few months since, a patient, about forty years old, who was upon twice for fistula, neither operation succeeding. On going to see the last had failed, I made a careful examination, and discovered a stri the lower part of the rectum. I am not aware that there had been picion of malignant disease, and the only reason which made me suspect i ence was the circumstance of the induration being very decided and ex I gave a cautious opinion, inclining rather to the view that the dise malignant. This patient has lately died with cancer of the rectum. mention that the surgeon who operated upon the fistula was a man experience and great skill.

The *treatment* to be adopted for malignant disease rectum can offer no other service, unfortunately, than t palliating the disease, assuaging pain, and prolongin duration of life. We have seen that, in instances of simple stricture of the rectum, the affection may be cured, or at all events kept under control, by the careful employment of proper surgical means and appliances; because the deposit forming the contraction is merely the result of inflammation, and thus may be absorbed or much diminished by the use of pressure; and moreover, the general constitutional health is not affected as when the disease is of a cancerous nature. Relief, however, can be given to those unfortunate persons who labour under the latter complaint; and it is important to enquire what are the measures best calculated to produce that relief.

There is a difference of opinion amongst surgeons as to whether the employment of dilatation is proper. As a rule it may be stated that bougies should not be used in malignant stricture of the rectum; but it is unwise to discard them entirely. When the disease is met with in its early stage, has not ulcerated, is within reach of the finger, and is producing much contraction of the calibre of the bowel, a wax bougie well oiled may be passed gently through the contracted part; and its use may be repeated once or twice in the week, if pain be not produced. In a case of extensive cancer of the rectum which had not ulcerated, I employed the bougie in this manner for a long period with the effect of giving relief. It is not to be expected that any absorption of the diseased tissue should take place beyond that which is deposited in connection with cancerous stricture as the mere result of inflammatory action. When, however, the disease has advanced to the ulcerative stage, it would be highly imprudent to use bougies.

The main object in the treatment is the alleviation of pain; and this is best effected by the use of anodynes exhibited in the shape of suppositories made of pil. saponis comp. or of morphia mixed with extract of hyoscyamus, in the proportion of half a grain of the salt to ten grains of the extract. This should be introduced each night into the rectum, and in the course of time the strength of the anodynes must be increased. I have seen very great relief given to the patient for many weeks by the use of this suppository. As the disease extends, and involves other parts, the suffering is much more severe, and it will be found necessary to give opium by the mouth as well as by the rectum, in order to produce a mitigation of pain.

The bowels are to be unloaded by the occasional use of aperients, and, when there is not much irritation caused, by the

exhibition of enemata of warm water. In order to sooth
ulcerated and painful parts, injections of tepid oil or of d
tion of poppies must be used from time to time : the su
must not forget to take great care in the introduction
enema-tube, as serious mischief may soon be effected.

During the time the malady is running its cours
strength of the patient, which will gradually decline fro
to day, must be supported by those articles of diet which c
the most nourishment in the smallest bulk, and which
but little fæculent matter in the intestines ; and it w
needful to avoid as much as possible vegetables and bread
profuse sanious and foul discharge which sometimes accom
this disease may be checked by an injection composed of su
of copper and opium, or a very diluted lotion of solut
chloride of zinc may be employed with benefit.

If sudden and complete obstruction of the bowels
occur during the course of this disease, it will be a quest
to how far the surgeon is justified in making an artificial
If this accident happens in the last stage of the disease,
the patient is much exhausted by previous suffering, I
think that the operation should be performed ; but if t
struction, which must be fatal, should occur during the
course of the affection and before the constitution of the p
has been much impaired, the surgeon is only doing his
he recommends a proceeding which, although in itsel
rounded with difficulty and danger, may yet prolong l
several months at least, and allow the patient to die at l
comparative ease. Some surgeons were, a few years si
the habit of performing excision of the lower part of the r
when affected with cancer ; but this proceeding must be l
upon both as barbarous and unscientific, and it is now, ha
exploded from the catalogue of surgical operations.

Polypus of the Rectum.

Polypus of the rectum, although a somewhat rare dise
not unfrequently seen by those who have large opportunit
studying the affections of this portion of the intestinal
It is met with in various forms, and it is important
acquainted with the disease, inasmuch as it often pro
most severe symptoms, and at the same time is easily rem

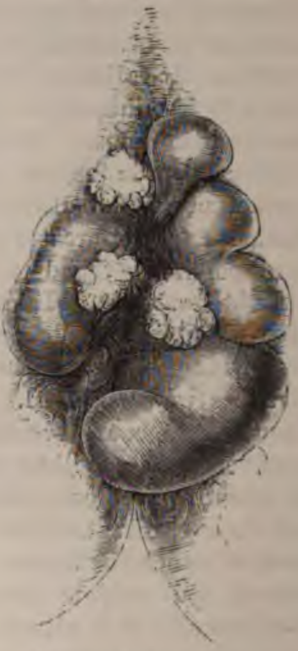
The most simple form in which a polypus is seen is there are one or more short processes, as it were, of the mucous membrane standing out prominent in the cavity of the rectum. These bodies, if they may be so termed, produce little uneasiness, and are generally only accidentally discovered when the surgeon is making an examination of the bowel with the speculum for some other disease. They are usually situated above the sphincter, cause very little inconvenience, and therefore do not demand the attention of the surgeon.

The soft gelatinous polypus, like that growing from the mucous membrane of the nostril, is very rarely indeed met with; but it is not an infrequent occurrence to observe a polypus which grows from the mucous membrane of the rectum about an inch from the orifice. It varies in length and thickness, being from half an inch to two inches in length, and as thick as a crow-quill or as the little finger. This form of tumour is of a reddish-white colour, firm in texture, and attached to the mucous membrane sometimes by two distinct stalks; or it may have only one attachment and a bifurcated extremity. On examination this form of polypus is found to be fibro-cellular in structure, and very slightly vascular. In one specimen of this fibrous polypus, which I lately removed from the mucous membrane of the gut just within the verge of the anus, some curious microscopical appearances were observed. The structure was principally fibrous, but the mucous covering was arranged so as to form a number of very distinct villous processes. It looked like a piece of small intestine; lacteals could be seen in the villous processes, and their trunks could be followed for some distance into the tissue of which the tumour was composed.

When seated high up, this polypus does not produce much uneasiness; but most generally it is attached to the bowel so near to the anus, that when the patient is at the closet the extremity of the tumour protrudes, and perhaps becomes gripped by the sphincter, and in this manner very annoying and painful symptoms are produced. Sometimes even the polypus protrudes when the patient walks about; great irritation exists; there is a discharge of mucus, sometimes of a little blood; and the patient is obliged to wear a support, which gives ease. He is conscious of some foreign body at the anus, but the symptoms are usually attributed to piles.

The only efficient treatment for this kind of polypus is to remove it; and as there is so little vascularity, it may safely be taken away by the scissors, especially when the tumour is very near to the anus; for if there be any hæmorrhage, it is e stop it. When the polypus is situate an inch or more the anus, and the base is at all broad, the tumour sho well brought down by an injection previously given, thread can be tied tightly around the base before the g is snipped away. In several cases, however, where I ha these fibrous polypi away without first tying them, the only been a very slight amount of bleeding subsequently.

FIG. 280.



Warty polypi at the anus.

A form of polypus very rarely met with is where the grow warty.

I lately saw a gentleman of middle age, who consulted me for prolaps on coming to examine him, after making him protrude the parts well, I attached to the base of the prolapsed portion, about an inch from the v the anus, a curious-looking mass, composed of an aggregation of sma arranged upon a peduncle, just like a bunch of grapes. This polypus, if be so termed, was an inch in length, of a reddish-white colour, and it pr at the centre of the anus. I removed this growth; and on micro examination its texture was chiefly or entirely epithelial, in fact it m considered as a warty growth.

The *vascular* polypus is, perhaps, of most frequent occurrence; it is chiefly met with in young children. The tumour varies in size from a cherry to a pea; is of a bright red colour; its structure is fibro-cellular, and eminently vascular. It is either situated within a short distance of the anus, or it may have its attachment one or two inches up the gut, by means of a long narrow stalk. The symptoms which this form of the disease produces is the prolapse of the tumour on the child evacuating the bowels, and hæmorrhage of a more or less profuse character. This bleeding not only takes place when the child is at the closet, but it will persist afterwards, when he is running about. The occurrence of this loss of blood in a child should lead to a close examination of the rectum for polypus; for if the tumour be attached high up, it will recede immediately after the action of the bowels, and escape observation. It is necessary, therefore, to make the inspection immediately after the evacuation of the contents of the rectum either by medicine or an enema.*

The treatment which should be adopted is simple, and merely consists in the removal of the polypus, either by twisting it off with a pair of forceps, or placing a ligature around the pedicle, and returning the tumour within the bowel and allowing it to slough off. Excision should not be resorted to in these cases, as there might be a considerable amount of bleeding, which would be especially prejudicial in a young child.

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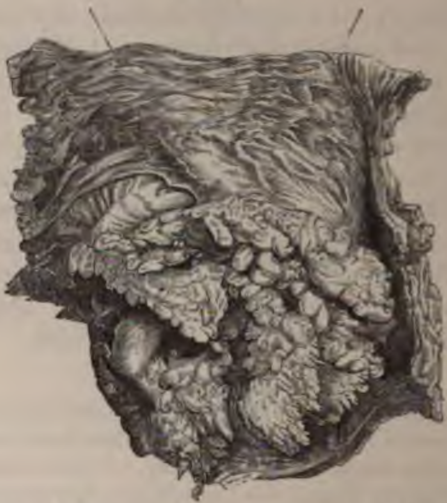
* It is very important to make a thorough examination of the rectum immeliately after the bowels have been acted upon, when there is a suspicion of a olypus, otherwise the disease may escape notice. A remarkable illustration of is occurred in a lady to whom I was called by a medical practitioner, who had en in constant attendance upon the patient, whose symptoms were referred to me external piles. These were removed, but with scarcely any relief to the vere pain experienced after the action of the bowels, and to the sense of prousion. I made a careful examination, after the bowels had been well cleared th an enema; but nothing was observable beyond a slight crack at the posrior part of the anus. It was thought right to divide this, in the hope that e severe pain would be removed by the operation, but this failed in its object; d we were vainly endeavouring to ascertain the cause of her suffering, until one occasion we found the patient had just got into bed after having had e bowels freely acted upon. I took the opportunity of examining her immeately, and to my great surprise found a large fleshy polypus attached high to the posterior wall of the gut by a narrow peduncle. Without further lay, I, with some difficulty, placed a double ligature around this tumour, and us fortunately removed a disease which, from being long undetected, had used great suffering. It was strange that this polypus had not shown itself hen I examined her on a previous occasion, after the action of the enema.

A rare form of polypus of the rectum is occasionally m
in adults, when the tumour reaches a size as large as a
it has been not inaptly termed the *villous* tumour, inasn
it mainly consists of elongated processes or villi, extrem
cular. This form of tumour produces most severe symp
a foreign body in the bowel, and is the cause of pe
hæmorrhage to a large extent, by which the health l
very much broken down. It is a question with som
whether this form of polypus is malignant or not.

Mr. Quain has made some investigations into the st
of this tumour, and he has found that it was composed

Fig. 281.



Villous tumour of the rectum. From a preparation in the Museum
St. George's Hospital.

processes slightly held together, each process strictly
bling villi. And as the mass is very vascular, he has co
that the disease is not of a malignant nature, as st
Rokitansky.

A very interesting specimen of this rare form of tumour of the rectu
served in the Museum of St. George's Hospital, and on examination i
exactly the features described by Mr. Quain. It was situated ab
inches from the verge of the anus, in the anterior wall of the rectum,
springing from the submucous cellular tissue. It is round in form, circu
and prominent, and about the size of an orange. The tufts or process
markably well developed. The tumour so obstructed the cavity of tl
that almost complete retention of the fæces resulted, and the gut above

much distended. The bladder was much pressed upon by the diseased mass. It was impossible to say how long the disease had been growing, but it was not detected until about five years before death, when the occurrence of hæmorrhage and of the symptoms before spoken of led to its discovery. Several attempts were made to destroy the mass by ligature and other means, but it was not possible to effect more than a partial removal of the more prominent portions,—an operation which was performed no less than thirty-three times before his death, and on each occasion with temporary benefit. The patient was seventy when he died, and no other disease was found on a careful examination of the body.*

I have only once met with an instance of a growth of this nature, but it was of a very interesting character, inasmuch as it had resisted treatment and had reduced the patient to a very low state. It was that of a married lady, sent to me by Dr. Rooke of Cheltenham. She had suffered much from profuse hæmorrhage from the bowel without any protrusion whatever, and when I first saw her it was extremely difficult to ascertain where the bleeding came from, but after a very careful examination with the speculum, I found a well-defined vascular growth, about the size of a crown piece, two inches from the anus. From the condition of the patient, and the appearance of the diseased parts, I was afraid that it might be of a malignant character, and this idea was somewhat confirmed by the continuance of the bleeding, notwithstanding very careful local and general treatment. However, finding milder measures fail, I determined to apply with vigour strong nitric acid to the part. This I did on several occasions, and was much pleased to find that the bleeding became checked, and after about half-a-dozen applications the hæmorrhage ceased, and the patient's health was rapidly restored. I saw this lady lately, some three years after the treatment, and she was in remarkably good health.

PRURITUS ANI.

This affection is very common, and very productive of suffering; and although certain pathological changes occur at the margin of the anus in connection with it, itching and irritation of this part must be regarded rather as a symptom than as a special disorder. Thus it is frequently associated with an unhealthy state of the secretions of the intestinal canal, or with simple constipation—a fact which is not uncommonly overlooked in the treatment of those who suffer; it is also attendant upon a congested state of the vessels of the rectum, which can hardly be considered hæmorrhoidal, inasmuch as on examination there will be found neither hæmorrhoidal tumours nor prolapsus, but a considerable amount of congestion of the mucous membrane. This form of the complaint is peculiarly prone to occur in those who sit for a long time together at the desk. Pruritus is amiliar to us as a symptom of ascarides in the rectum; it is

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* *Path. Soc. Trans.* xii. 120.

also found in a very distressing degree in connection w
ordered conditions of the womb. I have recently see
of ulcer of the rectum, where the only well-marked s
attending upon this usually painful morbid conditio
constant and troublesome itching.

Certain morbid changes occur around the margin of
in advanced cases of this disorder, in consequence of the
of the patients to relieve themselves by scratching
tating the parts; the naturally thin skin becomes ex
the secretions of the part are exaggerated; and if the
is continued, fissures, and even ulcerations, are formed
course of time the integument becomes thickened and in
and gets almost into a condylomatous state; and a pai
distressing itching is produced—especially when the
lies down in bed—which is most troublesome to remov

The treatment to be adopted in such cases is to be c
upon the ordinary principles of surgery. In the first
very careful examination of the parts must be institut
external and internal; and strict enquiry should be m
a view of ascertaining if there be any special cause
existence of the pruritus, such as ascarides or a loaded
the large intestines; in either case the exhibition of pu
and the use of enemata will be the proper plan of tr
and immediate relief ensues. If dyspepsia, together
unhealthy secretion, exist, strict avoidance of improper
of diet, and the occasional use of a pill composed of a
calomel and three or four of watery extract of al
frequently remove the itching of the anus, without the
ment of any local measure beyond the application of
soap and water. It is, however, in those cases wh
disease, although perhaps at first only a symptom,
neglect and irritation, degenerated more decidedly int
malady, that great difficulty is experienced in procurin
Here, at the same time that constitutional measures
neglected, local remedies will be mostly required; b
often many will be tried, one after the other, before the
relief can be obtained. In these cases there will be g
found some morbid alteration, in the form of slight ulc
or fissures of the skin, and the first object is to heal the
it may be effected by the very careful application of a
of nitrate of silver—of a strength varying from ten to
grains of the salt to an ounce of water—by means of a

hair brush. The application should be repeated so long as the cracks or ulcerations exist. Not unfrequently the itching and irritation will disappear so soon as these heal and the skin becomes healthy; but there is a tendency for the excoriations to reappear; and to prevent this, the patient should be advised to bathe the parts well morning and night with a strong solution of alum. If the solution of nitrate of silver fails either to heal the fissures, or to give relief to the itching when they are healed, an ointment composed of one drachm of glycerine to an ounce of lard may be used with good effect; and should there exist a thickened or condylomatous condition of the integument, I know of nothing more useful than the application of an ointment composed of one drachm of calomel and one ounce of lard. If an ulcer—as in the case mentioned before by me—should be found to exist within or upon the sphincter, the ordinary operation for that malady must be put in force.

In some obstinate cases, it will be found that the use of all the usual measures, general and local, will be unattended with relief. If it has not already been tried, I am in the habit of recommending the daily introduction of a well-oiled bougie made of black wax.

Neuralgia of the Rectum.

It is perhaps impossible to affirm with truth that neuralgia, as it attacks other parts of the body, is ever situated in the rectum; but every now and then cases are met with where extreme suffering of a distinctly neuralgic character is experienced for a long period, and where, on the most careful examination of the parts, both external and internal, no appreciable lesion can be found; and we therefore do not hesitate to apply the term neuralgia to this condition of things. The cases are more frequently met with in the persons of females who have been lowered by some depressing causes; the pain is described as being very severe and continuous, and not particularly aggravated by the action of the bowels, as is the case when the suffering is produced by a painful ulcer of the rectum. It may be of a marked periodical character, and be the result of direct exposure to cold.

The cure of this affection is extremely difficult, and indeed sometimes only a temporary relief can be given. Of course, when a patient applies with the symptoms of neuralgia, the most careful examination of the parts should be ins repeated from time to time; for doubtless in some of which have been supposed to be neuralgia, there ha lesion which has been overlooked. If, however, not kind can be met with, a similar treatment to that w in force for neuralgia in other parts should be a regard of course being had to the removal of any l from the bowels in the shape of hardened fæces quinine in large doses should be exhibited, especia cases where there has been any lowering of the syst there be any tendency to gout—a point not to be in our enquiries—colchicum should be prescribed. remedies best suited for this complaint are, the em the cold douche to the anus, and the use of belladonn in the proportions of one drachm of the extract to o lard, either smeared around the anus, or introdu rectum by means of a large wax bougie. Should measure be adopted, care should be taken to watch of the belladonna on the system.

HENRY

DISEASES OF THE URINARY ORGANS.

UNDER the term *urinary organs* will be here comprised the kidneys, ureter, bladder, prostate, and urethra.

It is extremely desirable, when dealing with any disease the ymptoms of which are referred chiefly or entirely to some imited portion of the important system defined above as urinary rgans, to possess an intelligent acquaintance, not merely with ny part which may be especially liable to suffer morbid changes, ut with the system itself as a whole. It is absolutely necessary o the formation of a correct diagnosis, to be familiar with the ntimate relations which exist between each portion of that ystem, as well as with the various peculiarities which each is rone to exhibit when influenced by disease. Few things conluce more to error in estimating symptoms than a too exclusive pecialism in the observation of disease. The study of stricture nd of other forms of urethral obstruction, of vesical diseases, f calculous formations, and of those chronic changes in the ecreting structure of the kidney which are conventionally ssigned to the province of the physician, must be pursued gether if the surgeon is properly to appreciate the import of y one of these affections. For example, suppose a surgeon to rform an important operation upon the bladder or urethra nd what operation there is not important?), who is unacainted with, or is at least indifferent to, the chemical and icroscopical characters of his patient's urine; will anyone, ho knows what those indications reveal, deny that elements ost important to the formation of a correct diagnosis, and, erefore, to an appropriate therapeutical scheme, must be sent from the mind of the surgeon in relation to that case? may be replied, that the necessary information can be obined from the physician. Ought the surgeon to be dependent r an acquaintance with the facts required upon any other server in such a case? Assuredly not; not only is the

of impaired urinary function, whose ha
the use of the sound or catheter, whos
urinary deposits in all their varieties o
renal casts, and who is not acquainted
far as these are known, as well as with
subjective phenomena which are fou
The exploring sound is quite as essen
urinary disease as the stethoscope is t
He who is, conventionally speaking, a
does) constantly overlook calculus an
detriment of the patient; while the m
man will (and does) treat mechanicall
only be injured by his manipulations.
careful study of all acute and chronic
mended to the student who desires to
for the practice of surgery.

The following is a table of those ren
sarily come under the observation of th
with the diseases of the bladder, prosta
frequently demand his services. Th
department of urinary disease in this
the slightest glance at them; it appe
necessary to make these introductory r

THE KIDNEYS:

Malformations.

Injuries (vol. ii. p. 651).

- *Inflammation*, (nephritis) *chronic*
  - calculous.
  - from obstruction.
  - diathetic.
- *Inflammation of pelvis of kidney* (pyelitis) *acute and chronic*
  - from obstruction.
  - calculous.
  - scrofulous.
- *Calculous nephralgia.*
- *Abscess of kidney and fistula.*
- *Perinephritic abscess.*
- *Tumours of kidney.*
- *Suppression of urine.*
- *Hæmaturia.*

Malformations.—There are few deviations from the normal conditions which can be regarded as malformations, and these are unimportant to the surgeon. It is only necessary therefore to enumerate the ordinary varieties. (1) There may be only one kidney, which is then usually larger than natural; it may lie in its usual place, or may in reality consist of the two organs joined in the median line, and occupy a position in front of the vertebral column. In the last-named condition the form is sometimes that of a horse-shoe with its convexity downwards. (2) One kidney may occupy its ordinary situation, and a second may be moveable, forming a tumour recognisable during life: or it may be fixed in an unusual situation, generally lower than natural, or within the pelvis. (3) The kidney may present an outline more or less lobulated, showing the persistence of a form existing in fœtal life, and natural in some of the lower animals.

Nephritis.—Acute and chronic.

Acute nephritis, of a severe form, is common in surgical practice. It exists also as a sequel to preëxisting chronic inflammation of the kidney, and in Bright's disease.

The causes of the first-named variety, with which almost exclusively we have to deal here, are as follows:

Wounds, bruises, and strains; by extension from the bladder in cases of calculus, stricture, and cystitis, following operations or otherwise; retention of urine, causing distension of the ureter and fluid pressure on the kidney; renal calculus; entozoa; extension of inflammation from neighbouring parts, as diseased

vertebræ, &c.; diuretics in over doses; canthar
turpentine; exposure to cold; and alcoholic drinks.
be observed that many of these causes act almost e
on the male, and in connection with surgical affect
the female, nephritis is more commonly associated wi
diseases.

Symptoms.—The first is usually an attack of rigors
often vomiting, prone to be obstinate, generally soon
Pains in the back and loins, dull and heavy, sometime
ating, increased by the upright position, by cough
vomiting, even by respiration, and often extending a
ureter. Occasionally there are aching or numbness
thigh of the side affected, and tenderness on pressure in t
region, sometimes considerable. Micturition is freque
urine is mostly high coloured and scanty; neutral or al
often mingled with blood, and then becoming albumino
otherwise; later in the disease it may be purulent. Un
microscope renal casts may be found containing pus and
corpuscles. Sometimes total suppression occurs. G
signs of fever are present, as heat of skin, dry furred t
headache, thirst, quick and hard pulse. Anasarca often a
also, in cases suddenly occurring from exposure to col
commonly in cases of extension from the bladder.

In the latter instances, suppuration in the substance
kidney is to be dreaded; the symptoms are then more i
there is great depression of the vital powers, and fata
often occurs by uræmic poisoning. If pyelitis accompa
supervenes on nephritis, there is also generally pain and
tion of the testicle on the affected side.

As it is impossible to include in this work a history o
renal and allied affections with which the surgeon sl
familiar, a few remarks will follow here on the dif
diagnosis of nephritis, so as to illustrate the leading cl
of those other diseases which might be confounded wit

The *diagnosis* is not generally difficult, although
instances it may be obscure. If a patient, who has
long from urethral or vesical disease, or who has recent
gone an operation for stone or stricture, suddenly sh
of an acute febrile invasion, with vomiting, pain and te
in the renal region, scanty urine, or urine mixed wi
there can be little doubt of the presence of acute n
When there is no history of previous urinary compl

ck of primary acute nephritis may sometimes be confounded the following affections: calculous nephralgia; pyelitis, ple and calculous; perinephritis; perinephritic abscess; al disease, or abscess of the psoas or adjacent parts; lum- o; renal neuralgia and hysteria; inflammation of the lder; vesical calculus.

. *Calculous nephralgia;* by which is intended the pain and emic disturbance occasioned by the descent of a calculus n the kidney to the bladder, and which sometimes resembles closely acute nephritis. Indeed, excepting only the severe ile symptoms, all those of nephritis are present. There is e pain, generally limited to one side, and shooting along loins to the sacrum, with retracted testicle; but the invasion ore sudden, and the pain more acute, than in nephritis. e may be vomiting, frequent micturition, and bloody urine; he constitutional disturbance, although it may sometimes esent in moderate degree, certainly falls short of the fever h always accompanies the inflammatory affection. If the lus obstructs the pelvis or ureter for any length of time, toms of calculous pyelitis may arise. And lastly, all the omena may suddenly disappear, which confirms the diag- of calculus.

Acute calculous pyelitis may be distinguished by the follow- haracters: the pain in the back is excessively severe and nating, much more so than in nephritis; shooting pains elt in the groin and inner part of the thigh, radiating to testicle, which is generally strongly retracted. When the itis is unaccompanied by renal affection, the urine is often ; and although it may be scanty at first, is subsequently ed in natural quantity. It may have much pus and helium mixed with it, and sometimes blood; if so, these ters are found in intimate admixture with the urine. The rse of the complaint is less rapid than that of nephritis, there are frequently considerable intervals of freedom from n.

. *Perinephritis; caries of spine.*—Inflammation of the tissue rounding the kidney does not generally make its appearance an acute attack. The subsequent formation of matter, if akes place, is accompanied by febrile symptoms; but the ually increasing swelling, in its later stages presenting fluc- ion, while at the same time the urine is healthy, is signifi- of simple perinephritic abscess, provided the special signs of

spinal disease are absent. If,
marked tenderness on pressur
the vertebral column, and, à
curvature, if there has been a
either of sensation or of motic
of disease. When abscess of
the signs of spinal disease, th
disturbance in the nerve-fun
and at the same time the mot
paired by the inability to act
psoas muscle. Pain on press
than behind, the reverse occu
times in nephritis.

4. *Rheumatic affection* of th
usually productive of great
which necessitates the slight
much more so than in nephr
where, but vomiting and othe
Again, the urine is neither s
in character; it may be more
alkaline.

5. *Renal neuralgia* is met w
severe pains are complained
hysterical temperaments, whic
observation to separate from
urine, mostly pale and abunda
symptoms, and the existenc
sufficient to mark these cases.

6. *Acute cystitis* is someti
which seem to indicate that t
There may be present great
febrile symptoms of severe c
and perineal regions; and t
and suffering in passing water
acid, exhibits abundance of
floating throughout, and is
albumen and no blood mixed
be alkaline; but this is genera
chronic form of disease. In l
urine becomes bloody.

7. *Calculus of the bladder*
aggravation of symptoms wh

nephritis. All the local and much of the constitutional disturbance of the latter complaint may be produced, as their rapid subsidence seems to indicate, from mere temporary irritation of the kidney, occasioned by the presence of calculus in the bladder. An examination of the previous history and symptoms, of the urine itself, and the speedy relief which follows simple remedial means, will indicate the real cause, respecting which the sound subsequently employed at the proper time will enable us to clear up any doubts which may still exist.

Treatment of acute nephritis.—It is of importance at the outset to insure free action of the liver and bowels, which are often very obstinate. In addition to active purgatives, enemata are recommended; but distension of the colon with irritating fluids is undesirable, and emollient injections alone are admissible; thus, turpentine should be avoided, lest absorption should irritate the kidney. Perfect rest in bed, and low diet, are to be enjoined. Local bleeding by leeches or by cupping is very serviceable: by the latter mode ten or twelve ounces may be taken, and the bleeding may be repeated with advantage if the patient is hale and the attack severe; otherwise, it should be followed by dry cupping, daily or on alternate days. The utility of antimony and salines (generally more or less diuretic) is questionable, and the repeated administration of diuretics is contraindicated; the moderate use of simple diluents, water, linseed-tea, barley-water, or milk-and-water, is preferable. Free action of the skin should be promoted by hot baths or large hot fomentations. For the vomiting, when obstinate and distressing, hydrocyanic acid and kreosote fail, though sometimes successful in mild cases; but counter-irritation to the loins and pit of the stomach affords better results; a constant supply of ice in the mouth also helps to allay it. When head-symptoms appear, the most efficient remedies are purgation and renewed counter-irritation over the renal region; similar applications should be made to the temples and to the nape of the neck, with hot bottles and sinapisms to the feet and legs. In applying counter-irritation, cantharides should not be employed, on account of its known irritant action on the kidney, in some cases even by endermic application; the desired result may be attained equally well by chloroform, ammonia, mustard, or more slowly by nitrate of silver. If either of the two former are selected, dilute with equal parts of spirit; soak a piece of lint the size desired and lay

on the surface, covering instantly with
gentle pressure; in a few minutes the f
In later stages of the complaint, intern
may be necessary.

Where acute nephritis first shows its
in surgical practice, by extension from t
in a debilitated subject, the general princ
must guide the treatment, but actual d
missible. All unnecessary irritation of
must be avoided, and no catheters be pa
necessary before, unless absolutely dema
of the case, and then with the utmost c
following lithotrity, all mechanical inte
pended, and catheterism used only t
retention. If suppuration take place
urine be suppressed, little can be hope
active counter-irritation of the renal regi
must be perseveringly employed while a

Treatment of the attack of calculous
bath; antispasmodics and opium liberally
to the renal region, and hot catapla
diuretics, particularly the decoction o
triticum repens; abundance of diluent d
occasional inhalation of chloroform, to r
period of ten to twenty minutes, has bee

Treatment of chronic pyelitis.—If occu
in the urethra, the most efficient treat
coming it, and enabling the urine to pas
the dilated and diseased pelvis of the
and pressure. At the same time, the
sometimes diminished by full doses of
of cubebs and the balsams; sometin
Abundant nutriment is generally necess
depends on calculus in the kidney, and
urine or the history has indicated prett
the formation, appropriate remedies can
of dissolving it or at least of hindering i
alkaline salts, as the citrate of potash i
acids, mineral or benzoic, for those whic
sources of local irritation must as much
as sudden or violent movements of th
habits of all kinds. Wherever the sign

lation are present, especially those of the tuberculous diathesis, the appropriate constitutional treatment must be enjoined. Scrofulous pyelitis is, however, rare.

Abscesses may be formed under these circumstances; also as the sequel of nephritis; they should not be opened until the tumour points and the diagnosis is perfectly clear. Often they are perinephritic, although originated by disease within the kidney itself; occasionally a calculus may be removed through the opening made. If not opened sufficiently early, these abscesses may make their way internally, or along the sheaths of muscles, and open in the groin or elsewhere. They may heal soundly, or give rise to renal fistula.

It is necessary to bear in mind that other tumours in the renal region may be confounded with abscess, such as cystic disease of the kidney; simple fluid distension of the pelvis; accumulation of blood in the same situation; encephaloid and tubercular deposits, and hydatid cysts adjacent to the kidney; besides abscesses, which are the effects of spinal caries. Among these, ordinary cystic disease affords no very obvious signs: the character of the urine may be unaffected; if the cyst is large, dulness on percussion is present. Distension of the pelvis with fluid may be due to retained urine, or merely serous fluid, and may in very rare cases afford the sense of fluctuation externally. If there is a partial communication with the ureter, the amount of water passed will differ greatly on different days. Cancer of the kidney is encephaloid in six cases out of seven; the pain is severe, the growth rapid, the tumour extremely large and abdominal; hæmaturia is present, and the diathesis is generally marked. Tubercle in the kidney rarely produces a tumour appreciable during life, and its symptoms point much more to the bladder than to the organ affected: tubercle in the lungs, and elsewhere, usually coexist. Tumours containing blood are almost invariably recognised as originating from direct violence, or from a strain in violent exercise. Tumours containing acephalocysts are very rare; they are usually in connection with the pelvis of the kidney, and may exist for a very long period without rupture, subsequent to which hooklets, &c. are found in the urine. In rare instances, both these and the tumour produced by great distension of the pelvis of the kidney have been successfully punctured.

Chronic nephritis is not always a well-marked disease, except as a sequel of the acute attack, not including under the term

that constitutional state of whic
admixture of albumen in the u
known as Bright's disease. Here t
perhaps secondarily affected; bu
may be always noted in advanced
importance that the surgeon sho
mena, as, in dealing with dise
urethra, the presence of Bright's
grave import, which may greatl
quired by the other affection; ne
character as a blood disease m
here.

The remedial means for simpl
local stimulating applications t
specific renal irritants, before spe
stitutional treatment of chronic i

Renal calculi.—(See the essay

Hæmaturia signifies simply
blood; which may exist in a
discoverable only by the micros
constitutes the major proportio
urethra. It is a symptom, mere
the urinary organs. When blood
and has been in contact with the
the latter presents a peculiar
to the practised eye, and commo
If in large quantity, under simil
has the appearance of thick or
blood in hæmaturia may be any
parts: the kidney, the pelvis of
prostate, or urethra.

Hæmaturia occurs in acute
kidney; from injury, as by blow
any part of the urinary tract; fr
tine or cantharides; in cystitis
in malignant disease of any pa
villous tumours of the bladder;
and in certain states of the bl
allied conditions; in stricture
from the local application of me

It is always important to determine its source; the following hints will assist in forming a correct diagnosis:

Renal hæmorrhage, not being traumatic, is usually preceded or accompanied by some signs of kidney-disease; which is most frequently acute desquamative nephritis, and renal casts are usually found in the urinary deposit; the blood is always intimately mixed with the urine, which shows the smoky tint. Further, it may be said, as a general rule, that such urine passed without pain, or any other local symptom whatever, is more likely to derive its blood from the kidney than elsewhere. Hæmaturia from a calculus impacted in the pelvis or ureter is associated with the history and signs of the occurrence (see Calculous Nephralgia). Hæmaturia caused by a blow on the back is mostly from the pelvis or ureter. Malignant disease occasioning hæmaturia presents sooner or later some physical characters associated with the organ which is affected.

Blood derived from the neck of the bladder or prostate generally remains within the cavity, and if in large quantity forms a clot there, perhaps distending the viscus; or the urine has the colour of porter, and a darker sanies comes away at the close of micturition. When altogether from the prostate, a portion usually issues unmixed with urine by the urethra. In malignant disease of the bladder or prostate, disintegrated shreds of tissue come away with the urine, and occasionally cancer-cells (so called), and the blood is apt to appear suddenly in large quantity. In villous tumour, characteristic shreds of that growth are sometimes detached; in both this and the preceding case the bleeding is large, and its occurrence irregular, but it is much less so in the latter case than in the former. With villous growth the blood is more intimately mixed with the urine, which is constantly more or less stained. The appearance of a drop or two of almost unmixed blood at the end of passing water may be caused by either calculus or chronic prostatitis; the history, the distinctive symptoms, and the sound will determine which.

When the hæmaturia is due to urethral sources, and these are numerous (such as injury to the penis from blows or lacerations, and in falls, with or without fracture of the pelvic bones; chordee; occasionally from rupture in sexual intercourse; from surgical instruments; in some forms of stricture, from severe efforts to pass water; impacted calculus; sometimes in severe gonorrhœa; phagædenic ulceration; and malignant

disease), it will be found t
with the urine, it generall
state, unmixed with the co
times than during the act o
also, forming casts of the u

It is necessary to take c
in the alleged hæmaturia i
other colouring matters, al
a dark and reddish tinge.
heat, and the precipitate o
microscope determines it w
often a matter of extreme i
with calculus in its early st
detection of the blood-corp
the only certain method.

Treatment.—Renal hæmo
calculus, malignant diseas
the recumbent position, an
and sulphuric acid, matico,
opium; when produced b
iron and other appropria
bladder may demand simila
siderable; but local means
should be applied to the
patient maintaining perfect
or iced infusion of matico,
or small pieces of ice may
commended that a catheter
the clot broken up, and tha
by applying an exhausted
strument; but such interfer
necessary from retention of
disturbing a clot is liable
recently deposited fibrin, a
which more blood may be p
for regarding the clot as a
at all hazards. The solv
temperature of about 100°
the most efficient and the sa

It does happen, though
means must be adopted to r
the bladder has even been o

pose; in almost all cases it is wiser to allow nature to do the work, than to be officious in rendering assistance. The distress occasioned to the patient by the urgent wants to micturate is greatly relieved by the use of opium either by mouth or rectum. When it is necessary, however, to use an instrument, as when the patient is incapable of passing any urine by his own efforts, a full-sized catheter should be passed, and a syringe, or stomach-pump, or, better still, Clover's exhausting apparatus for lithotrity, adapted to it, by means of which a considerable portion of clot may be gently withdrawn. It should not be forgotten that Sir B. Brodie records a case in which, all other remedies having failed, a dose of Ruspini's styptic, administered internally two or three times in the course of twelve hours, was followed by complete cessation of the bleeding.

Suppression of urine.—This term applies only to a condition in which the kidney fails to perform its function of secreting urine. The bladder is empty, or having been emptied, continues so, since it receives no more by the ureters. Meantime the materials of the excretion accumulate in the blood, and the vital powers become oppressed; a comatose state ensues, and finally death, unless the eliminating function of the kidney is resumed, and the urine again excreted. This function is sometimes totally, but only temporarily, suspended; more commonly it is after long impairment by chronic disease gradually extinguished. Advanced chronic disease existing, any sudden shock from operation, however slight, from acute attack, &c., may rapidly induce fatal suppression. The two conditions of suppression and retention have been much confounded. None, however, can be more distinct: in the former the bladder is empty, in the latter it is unnaturally full; in the former no urine is secreted, in the latter the secretion goes on as usual, but some obstacle opposes its removal from the bladder. The symptoms are these: the patient usually complains of languor; fever, vomiting, more or less pain in the back and loins; he is unable to pass urine, or only a very small quantity: he soon becomes drowsy, perhaps delirious, then comatose, and dies in from two to four days if suppression remains complete. There may be anasarca, but often there is none. Catheterism shows that the bladder is empty.

Treatment.—Local cupping; but if the patient is in low condition, without abstraction of blood; hot fomentations and counter-irritation to the renal region. The hot-air bath and

free purgation, to aid in elim
I have seen, in one case only
of complete suppression : I h
twenty hours. In the later s
is to be hoped for from treat

The Ureters present very li
Malformations.—The most
ral condition is that of incre
may issue from one kidney,
bladder, but much more freq
Sometimes one ureter only e
complete, and forms a canal
these conditions possess inte
The ureter is liable to inflam
the bladder to the kidney.
stricture or of obliteration,
duced by injury caused by th
occasionally from pressure b
injury. It is often greatly
the neck of the bladder, or i
sure slowly acting upon it; a
to become a supplementary
even been seen prolapsed int
there. It may be the subj
disease by extension downw
from the bladder. A calcul
sage through the ureter, occ
Nephralgia).

THE

Malformations.—These are
whatever kind, they are the
even of misery, to the subje
1. Absence of the bladder.
very rarely, absent. (*a*) Th
municate directly with the
were somewhat dilated befo
dition was not noticed. Th
in the male sex. (*b*) Less
entering the rectum, and

ely by that channel. These instances have chiefly, although ntirely, been discovered in the male. (*c*) A few instances on record in which the ureters opened directly into the na.

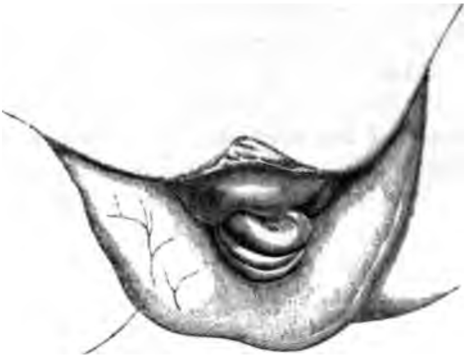
Two or more bladders, it is said, may co-exist in the same ect as a congenital malformation. Two cases only are re- ed which have any title to be so regarded: one of these rred in a man in whom the ureter of each side appeared to its own distinct bladder, the two reservoirs being closely ed to each other at their adjacent surfaces (Blasius); the r in a woman who is reported to have had five bladders, five eys, and six ureters (Molinetti). I am satisfied that other reported as belonging to this category, including one tly described with great detail, were evidently examples of lation resulting from long-standing disease. Sometimes rgan appears to be partially divided by a septum, or to be d of two more or less symmetrical lobes; but although cases have been often regarded as instances of malforma- they are in reality also the effects of disease.

Extroversion of the bladder. This is the least rare of all ices of conformation to which the organ is subject. In these the anterior wall of the bladder is wanting, while frequently, ot invariably, the pubic symphysis is absent also. The rior wall and base of the organ are then pushed forward e abdominal viscera, and form a red and vascular flattened inence, covered by mucous membrane, in the situation of ubes. The extroverted portion is in the adult usually about ize of the palm of the hand; the orifices of the ureters may een just below the centre, and from beneath the lower in a short imperfect penis projects, which is flattened, as if in the median line, into the urethra. At the root of the a rudimentary prostatic structure exists, the ducts of h can be seen opening into the angle between the bladder pubes. There is usually more or less hernia of the bowels ither side and beneath the extroverted bladder, into a pouch- fold of integument, which is covered with hair, represents scrotum, and contains the testes. The mucous membrane ery sensitive, readily bleeds when touched, and from the ecting orifices of the ureters urine is almost continually dis- g over its surface. This condition produces much excoria- of the skin on the parts beneath, besides infecting the nt with a continual urinous odour. The malformation

thus described affects both sexes, but appears to be mo
in the male. Of eight cases which I have personally
two only were in the female. From the condition thus
there are some slight peculiarities of detail in diffe
but most conform very much to the characters g
defect is of a less serious character, sexually conside
female, as the generative function does not necessa
in abeyance; the male, however, is, from the condit
penis, wholly incapacitated for its exercise.

Treatment of malformations.—The results of extrov
be palliated by well-adapted mechanical means; a
reservoir may be employed, but great nicety of fit and
for adjustment in various positions of the body must b

Fig. 282.



Extroversion of the bladder, drawn from life. The upper and largest
the mucous membrane of the bladder, with an aspect like red velve
of the ureters are hidden beneath its lower margin. Below that i
wide penis; the exposed urethra opened out in its whole course
aspect. The large pendulous bag below all contains the testicles
testine.

by the mechanician. Little formerly could be sai
results of past experience, in favour of the employm
rative measures to remedy these defects. Dieffe
Langenbeck in Germany, Richard and Nélaton in
made attempts to remedy deficiencies of this kind,
the latter being however rather examples of complete
than extroversion of the bladder. Pancoast of Phil
1858, was also partially successful in an instance
named condition. In our own country Mr. Simon, of S
Hospital, has attempted, in a male case, to turn back

the ureters into the rectum; but with results which could
rcely be considered successful, although approximating
reto. Other cases of operation have been fatal. In the
ale the nature of the operation required is less formidable,
much as the indication is rather simply to cover the bladder
n to alter the course of the ureters. Dr. Daniel Ayres, of
oklyn, U.S., appears to have succeeded in covering the ex-
erted bladder of a young woman with integuments borrowed
n the neighbouring parts of the abdomen.* The operation
sisted in bringing down a flap of skin from the part above,
turning it down over the bladder below, so that the cutane-
surface was in contact with the mucous membrane, and in
ging up the integuments, previously raised by dissection,
each side of the vulva towards the middle line to meet the
described. The result obtained was a covering to the
der, and a small opening for the exit of the urine, which
tted with ease the application of an efficient apparatus to
n it. But Mr. Holmes has recently succeeded in covering
part by lateral flaps, in a young male child. Incontinence
s of course as before; but an instrument may now be easily
ived to catch the urine, and the patient no longer suffers
or abrasion by friction. I have examined this patient, and
der the improvement beyond question. (See *Lancet*, 1863,
p. 714.)

nce this period, Mr. Holmes has developed and improved
method, having several times repeated the operation. By
ring in the exposed mucous surface and contriving to
e a small opening only at the lower part for the escape
urine, he has saved the pain of contact between the
sitive surface and the patient's clothes, and ensured the
oval of urine without excoriating the skin: very important
ects and well repaying, when attained, the somewhat tedious
repeated steps of a plastic operation.

He has also designed a procedure for forming artificially a
d of cloaca, common to the ends of the ureters and the
tum, by inducing sloughing of the tissues composing the
gone of the bladder and the anterior wall of the bowel. For

Congenital Exstrophy of the Urinary Bladder. By Daniel Ayres, M.D.
York, 1859. Another successful case is reported by Mr. E. Barker of
bourne in the *Medico-Chirurgical Transactions*, vol. liii. p. 187.

details in relation to bot
consult the author's wor

Mr. John Wood, of K
cally studied the subject
and with considerable
summer of 1868) on eig
his modes of proceeding
found in the *Medical and*

Injuries of the bladder.

Diseases of the bladder.
the numerous affections
heading, I shall adopt t
of perspicuity. We sha
sent local anatomical c
extent of the lesion w
observed ; and, secondly,
similar symptoms occur,
rally involve any organic

I. *Diseases which involve*
of which is generally
appreciable after deat

These may be arrange

Inflammation (cystitis) : { Acute . .

---

[*] *The Surgical Treatment of*
149.

[†] Vol. lii. pp. 85-131.

ıation
tis) :
- Chronic (*a* with, and *b* without, catarrh) :
  - as a sequel of acute.
  - as the result of obstruction to the outflow of urine from
    - stricture of urethra.
    - tumours in urethra.
    - bar at the neck of of the bladder.
    - enlarged prostate.
    - calculi or other foreign bodies in the urethra.
    - tumours of the penis itself.
  - from foreign bodies in the bladder.
  - „ growths in the bladder.
  - „ altered urine.
  - „ paralysis.
  - „ over-distension or atony.
  - „ displacement.
  - „ disease of neighbouring organs (uterus, rectum, &c.).

uration of the bladder.
ss of the bladder.
ation, simple and non-malignant, and gangrene.
o-intestinal fistula.
rtrophy and sacculation of the bladder : dilatation.
al hæmaturia. (See Hæmaturia.)

ours and growths
1. Fibrous
   - warty.
   - polypoid.
2. Villous or vascular.
3. Epithelioma.
4. Malignant.

rcle of the bladder.
at the neck of the bladder.
ia of the bladder.
ign bodies in the bladder.
uli. (See the essay on that subject.)
sion of the bladder.
ure of the bladder. (See the section on Stricture.)

onditions which do not necessarily involve organic structanges appreciable by known methods of observation, and nes associated with some injury or derangement of a centre.

Paralysis.

Atony from over-distensi
caused by

'Irritable bladder' (*i.*
quent).

'Spasm of the bladde
involuntary, and exceedi

Perverted sensibility of

I shall then consider
tion of micturition produ

Incontinence of urine

Habitual engorgement
dium urinæ).

Retention of urine.

Inflammation of the bla
seat of inflammation of
mucous membrane; occ
of the process, the cellul
may be involved, and p
there is no evidence wh
and independent inflam
the middle and outer co

The mucous membran
of the urethra or neck
often most severely, affe
common form of cystit
urethra, as in gonorrhœ
of the lining membrane
death simply injected a
may have become more
slaty in colour, as happen
siderable period of time.
and membrane-like shre
extended layer of this or
adhering to the whole
a false membrane has
and necessitated punctu
female it is sometimes t

'auses.—The traumatic are numerous. Injuries such as blows l pelvic fractures; operations of lithotomy, lithotrity, and inary catheterism; injections; in the female, prolonged and trumental labours; mechanical irritation of calculus; the mical action of cantharides and of some mineral poisons, and ong diuretics; action of the urine itself, retained and decom- ed, as in stricture and prostatic enlargement; inflammation adjacent parts, as kidneys, prostate, rectum (?), urethra, ecially the last, giving rise to a common but mild variety; n chronic pre-existing inflammation; rarely from external l, and occasionally from gout.

ymptoms; of the graver form, occurring after operations and -existing chronic disease. The invasion is ushered in by rs, the signs of general fever, followed by perspiring skin. desire to pass water is very frequent, sometimes quite un- trollable; the act is excessively painful, often accompanied ectal pain and tenesmus. Pain is constant behind the pubic physis and in the perineum and in the penis; also in the um and loins; sometimes in the groin and upper part of the h. There is tenderness to supra-pubic pressure, often on lower half of the abdomen, the patient's legs being raised elax its parietes; much pain is produced by rectal exami- on, still more by catheterism. The urine is at first high- ured, scanty, and clouded; then obviously reddish, like the hings of raw meat; soon purulent and loaded with shreds; le the blood-tint continues, perhaps deepens. Meantime patient's condition becomes low; he is often delirious; and he disease is not checked, he dies in from seven to fourteen s. The attack is frequently fatal.

he symptoms of the milder form, which occurs by extension n gonorrhœal inflammation of the urethra, are chiefly local. y are, painful irritability of the bladder, sometimes very ressing; supra-pubic pain; pains in the sacrum, perineum, thighs; loss of appetite, but not always marked fever. The t to pass water must be complied with instantly, and is remely painful. The urine is cloudy, and deposits more or mucus and pus. It may be fairly supposed that in this up of symptoms the mucous membrane of the neck of the lder is chiefly affected, and not that of the entire viscus; most common termination is resolution; while in the re serious form described above, the whole of the mucous mbrane is affected, and perhaps some of the tissues sub-

jacent; it may also become ulcera
worst cases.

Treatment, of the milder form. A
purge at the outset. Leeches to the
rather severe, followed by hot poulti
Hot hip-baths twice a day, 100° to 1
supply of diluent drinks, as barley-w
little citrate of potash, say one drachn
but small doses of antimony, at the
be severe. Hot linseed-poultices to
is much pain there. If the irritabili
half-drachm to one-drachm doses of t
every two or three hours should be t
this failing, opium and hyoscyam
enemata may be administered. Th
not lowering. As the acute stage pa
may be watched, in one or two oun
and then of small quantities of tinct
or of capivi, giving twenty minims
eight of the latter, thrice daily. In
ment advised above is to be adopte
but if the general fever heightens, ar
appear or threaten, support and alc
given freely, and large hot local
maintained, should be substituted f
by the mouth, is usually necessary
with warm enemata, daily, to unlo
must be watched for, and the cathet
employed if necessary; but never u
If there are signs of renal inflamma
treatment must be vigorously applie

Cystitis resulting from canthar
absorbed comes on usually within t
dose; the symptoms resemble tho
soon reach their maximum of inte
six to twelve hours. When at the
tion of the urine, as soon as a few
the bladder, is excessively painful.
blood appears in the urine, but
shreds of lymph also. The treatme
of potash and full doses of hyosc
three or four hours, and perfect r

ody aggravate the symptoms. It is highly important, if a lister has been the cause, to remove it at once, and to sponge vell the surface in order to detach every particle of the cantha-ides which may be adhering to the skin.

Chronic cystitis.—Of all urinary affections, this is one of the ost common, since it is apt to complicate almost every other t one time or another. Its causes also are numerous and aried. First of all, on the subsidence of the acute form, a hronic condition commonly supervenes, and may continue for very considerable period. Next, all forms of obstruction to he exit of urine produce chronic cystitis, by confining the rine until it becomes slightly decomposed, and consequently ritating to the mucous lining of the bladder. This condition intensified if the contractions of the bladder are also unusually equent and painful. Inability to empty the viscus, from aralysis or atony, when no obstruction is present, acts in a recisely similar manner. If the urine is unduly acid or alkaline; it be loaded with deposits from the kidney; sometimes if iluted or watery; if it be morbid, as in Bright's disease, or harged with irritating matters, such as diuretic salts, &c.,—hronic cystitis may be induced. Foreign bodies in the cavity f the bladder powerfully excite this disease; also tumours of ll kinds, simple and malignant. Diseases of the rectum some-imes, such as piles, prolapsus, and cancer, those of the uterus lso, by causing pressure, and *à fortiori* when implicating the oats of the bladder, are among well-recognised causes. The ladder is sometimes, although rarely, displaced by adhesion to eighbouring parts, as to the intestine, usually to a portion of e lesser bowel; or it may be forced into a hernial protrusion: either case its contents are partially retained by pressure, d thus produce more or less of the affection in question.

The structure affected is the mucous membrane lining the adder; rarely is any other implicated. After long-persisting flammation, it is thick, velvety, and dark in colour, its vessels ing loaded, while the underlying fibres are usually hypertro-ied. Chronic or subacute cystitis appears in two distinct rms: the first, an ordinary inflammation, in which a more or ss active hyperæmia, hypersensibility, and very slight increase f secretion, are the main elements; the second, often a condi-ion succeeding to this or to the acute form, in which a passive r congestive hyperæmia from local debility in the capillaries,

present, capable of being detected by t
circumstances: and is therefore by no
import, as it is often taken to be. An
or near the bladder may give rise to c
cause being removed, the effects ge
Ordinarily it ceases with rest, hot hip-
mild aperients, and sufficient alkali to
acidity of the urine or nearly so, not t
necessary, the use of buchu, triticum r
in small doses, may be adopted. The
form of the complaint, however, is that
of treatment becomes wide and importa

Chronic cystitis with increased secretion
tion of the mucous membrane has
Respecting the nature of the discharge
of opinion has been manifested by diffe
eye characteristics are well known. At
into which the urine has been passe
transparent, tenacious, ropy material, v
white of an egg, is soon deposited. O
tents of the vessel, it is seen at first to
soon it slides down in a mass, almos
then falls out suddenly and heavily.
regarded by some as simple mucus;
secretion; and more recently as merely

tureless fluid, containing numerous pus corpuscles and young epithelial cells; but the proportion of the liquor to the corpuscles is much larger than in ordinary pus. The old term, muco-pus, describes it perhaps more correctly than any other.

Causes.—An attack of acute cystitis; permanent obstruction of any kind, causing retention, stagnation, and decomposition of the urine; calculi and other foreign bodies; tumours in the bladder; spinal paralysis, not only as a cause of retained urine, but as occasioning perverted action of the mucous membrane by impaired nervous supply; and all causes which produce a long-continued irritation of the organ.

Treatment.—The inflammation is of chronic and atonic character; depletion and antiphlogistic remedies are therefore contra-indicated. On the contrary, the treatment should be mainly tonic and astringent. It is also more topical than general, since the remedies taken internally appear to act mainly, if not entirely, by their local influence, impregnating the urine which is retained in the bladder. It will nevertheless be advantageous to regard it under two heads, as topical and as general treatment.

1. *Topical treatment,* strictly so called. One important indication in the treatment of this affection is to maintain the mucous membrane of the bladder as free from inorganic or other deposit as is possible. The urine itself also, if alkaline and irritating, must not be permitted to remain in constant contact with the diseased membrane. It is therefore desirable to introduce the catheter for the purpose, first, of insuring the complete contraction and evacuation of the bladder, if its own efforts do not accomplish this; and secondly, to remove morbid deposits by injecting warm water, and washing out the interior of the viscus. This is often productive of great comfort to the patient; and increased benefit may sometimes be obtained by cautiously impregnating the water so employed with astringent or sedative agents. Of the former kind, one of the best is the acetate of lead, commencing with one-sixth of a grain to the ounce of water; next to this, the nitrate of silver, commencing with one grain to eight ounces of distilled water; or nitric acid may be used, in the proportion of ten minims of dilute acid to four ounces of water. By slow degrees the nitrate may be increased as far as to one grain to the ounce in some obstinate cases, and with much advantage. After washing out the bladder with plain water, at a temperature of about 98° or 100°

(a gum catheter and india-rubber bottle, with nozzle and
cock, is the best apparatus), about two or three ounces
fluid, which should have the same temperature, should be
injected, and, after remaining two or three minutes, be al
to flow out. Two or three drops of carbolic acid to half
of water is a useful injection when the urine is fetid.

Anodyne solutions may be used, but are of small val
have employed the following: Dissolve one drachm o
extract, conium and hyoscyamus, and half a drachm of ext
opium, in two drachms of proof-spirit and fourteen drac
water; of this solution, add a sixth or a fourth part t
ounces of warm water for an injection, to remain in the b
five minutes; two-thirds should then be permitted to flo
and the catheter withdrawn; the rest is retained in the bl

All the manipulation connected with these processes m
of the most gentle kind, otherwise more harm will be d
the manual interference than good by the therapeutical el
And where the plan is manifestly not producing some m
benefit after a few trials, and, *à fortiori*, if it increas
symptoms, the application must be discontinued.

It should be borne in mind, however, that on all occasi
washing out the bladder, a small quantity of liquid only
as two to three ounces, is to be injected. This may of
highly useful, while the employment of double this qu
may be productive of nothing but mischief. The blad
usually more or less irritated by throwing in so much as
six ounces; and it is on this account that I have long cea
employ injections in lithotrity, a plan attended with no
benefit.

Counter-irritation is not very manageable in these
although sometimes useful. I have employed a Burgundy
plaster, croton-oil in soap-liniment, and strong tinctu
iodine, over the pubes, the latter to the perineum also
some advantage, after shaving the hair. Cantharides,
said, must be avoided; but I have found no disadvantage
its application to the perineum in the form of the strong a
lyttæ; and where the inflammation chiefly affects the n
the bladder, it has sometimes an excellent effect. No
application to the pubes for general purposes exists than
linseed-poultice, the surface of which has been sprinkled
mustard.

The pain and loss of sleep often present demand the opiates either by mouth or rectum, and generally also such use of aperients as the system demands in consequence. Each case requires often a different treatment; some experiencing more relief from opium by the mouth, others from suppositories or small enemata. Opium alone, or with belladona, or conium, or hyoscyamus, may be administered often with the best results, through the rectum, and with a most tranquillising effect on the bladder.

2. *Internal remedies.*—Among the most popular are the infusions of buchu and uva ursi, and the decoction of pareira brava. The indications for their use appear to be the following: chronic mucous discharge from the bladder in large quantity, associated with relaxation and debility, no inflammation being present, may be controlled by the astringent tonic uva ursi; or this agent may be employed with equal parts of decoction of pareira. Chimaphila is considered by some appropriate in this complaint. The decoction of senega is perhaps superior. In this state also small doses of copaiba or oil of cubebs diminish the secretion considerably. When micturition is frequent, the urine is cloudy, and inflammation is present, a pint daily of decoction of triticum repens (two ounces to the pint), or a half-pint of the infusion of buchu during the same period, may afford great relief.

Dr. Gross employs a combination, sometimes useful in irritable and inflammatory states of the bladder. One ounce and a half of the leaves of uva ursi, and half an ounce of hops, are infused in two pints of boiling water in a covered vessel for two hours; a wineglass to be taken several times a day.

Demulcents are useful by diluting the renal secretion, at the same time that they furnish some little nutriment to the body, and in some instances, perhaps, exert some special therapeutic influence. They are also agreeable vehicles for the administration of acids, alkalies, and other agents, when these are required. Among the most useful are the decoction of marsh mallow, or of the common mallow in its absence; the decoction of carrageen, or Irish moss; the infusion of linseed; the infusion of the bark of slippery elm; the decoction of barley, better known as barley-water; and a solution of gum arabic in water.

The alkalies and the acids are valuable remedies when appropriately given. The old rule of administering the former when the urine is too acid, and the latter whenever it is alkaline, is

not to be followed. No doubt,
it may be most effectually dim
the alkaline bicarbonate, as wel
but this is rarely the case in ch
to neutralise the alkalinity of
stantly present in catarrh. So
ally to be obtained from smal
the urine is alkaline from large
and decomposition of urinary s
is secreted with its full amount
it is liable to irritate a vesical
bility is already exalted by infl
has proposed to give in such
citrate of potash, to neutralise
that this cause of irritation ma
a certain benefit is thus attain
ever, not to produce alkalinit
object to diminish. The miner
on the reaction of the urine.
hydrochloric may be given, wit
ever. The benzoic acid is excr
quantity of this insoluble drug
urine. Lemon-juice in full
Alkaline urine chiefly depends
local treatment is mainly requi

In almost all instances, the
nutritious diet; and sometime
is called for. It is of great imp
system in good order, and to av
viscera; an occasional dose of
viceable to the patient. Rest
abstinence from all exertion,
in themselves matters of the fir

Suppuration of the bladder
catarrh, already described, co
purulent secretion. It is to b
astringent injections, and has
the last subject. The larger t
of catarrh, the graver is the ex

Abscess of the bladder.—Occa
the walls of the bladder; thes

isting severe disease, usually of a chronic character. Their istence is rarely to be diagnosed or even suspected during e, and no special treatment is indicated.

Ulceration of the bladder.—This is by no means a common fection, and seldom occurs except in the last stage of urethro-sical disease, arising from obstruction when, after long-standg inflammation of the mucous membrane, ulceration takes ace. It may result also in advanced tubercular and malignant iseases of the bladder; the ulceration following softening of e tubercular deposit, and disintegration of the cancerous rowths. A simple form of ulcer has been observed to occur om permitting a silver catheter to remain with a large portion the instrument within the cavity of the bladder, upon the ucous membrane of which it has rested or impinged for some ys. Signs of ulceration are, blood in the urine, severe pain a fixed spot, constitutional depression, usually soon ending death. The urine contains débris of mucous membrane; and the ulcer increases rapidly, or the tissues become gangrenous, ere is much fœtor and dark sanious matter mixed with the cretion. Instrumental explorations are exceedingly painful; ere is constant desire to pass water, and the effort produces ten severe agony.

Treatment.—Stimulants and support for the general condition; ll doses of opiates, by mouth and rectum; small doses of lkali internally, and diluents; no unnecessary mechanical inerference to be permitted.

Vesico-intestinal fistula.—Fistulous openings sometimes form etween the bladder and some portion of the intestinal canal. The result is, that some of the liquids from this latter source nter, at first in minute quantity, and give rise usually to much ritability of the bladder, and other symptoms of subacute stitis. These are sometimes the earliest signs of the existence an abnormal communication. If the urine is examined at is early period, fragments of vegetable and of animal fibre ay be discovered under the microscope. I have myself been le to diagnose at an early stage, in otherwise doubtful cirmstances, the existence of vesico-intestinal fistula by this eans. Usually the symptoms become gradually more severe, d the fæcal odour and colour are communicated to the urine. t length, considerable fragments of fæcal matter enter the scus, become partially dissolved there, and pass through the

urethra. I have seen several cases of this distressin
both in the male and in the female, but chiefly in t
and in these, carcinomatous disease in the abdome
the most frequent but not the only cause. Thus, ad
take place between an ulcerating bowel and the bl
the ulceration may extend into the latter, no cance
being present.

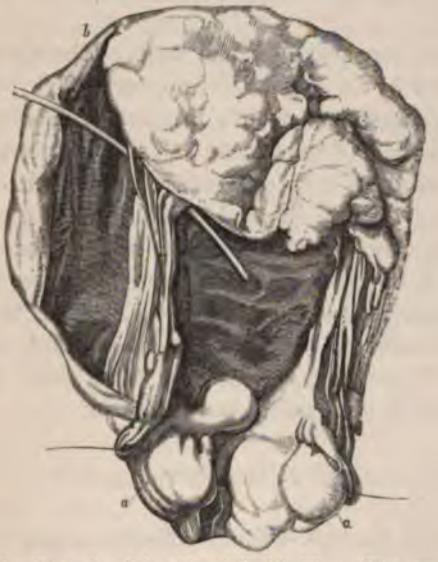
Treatment.—Little can be said in relation to
The lesion having been determined, instrumental
is—except under special necessity, such as for the
removing foreign bodies from the bladder, which
of great misery—to be shunned. The use of purga
to be avoided ; but the bowels should be maintain
possible, in the natural condition. The food is t
will nourish the body without producing a large
residue of fæcal matter. In one case under my
which a gentleman passed for several months the
fæces by the urethra, a great amount of suffering wa
by swallowing indigestible substances, like grape
husks. Subsequently, by a careful selection of fluid
the most painful features of the case were much
Now and then washing out the bladder with small q
tepid water gently thrown in contributed to the pat
fort. In this case the ulceration was not due to can

For some of these cases of non-malignant disea
form of treatment remains. When it can be deter
the fistulous passage connects the bladder with the
with the sigmoid flexure of the colon, the propriety
the descending colon [Amussat's operation] ought
sidered. In one case, recorded in the *Medical and*
Transactions, vol. xxxiii., Mr. Pennell of Rio Janeiro
this operation with success, diverting the passage of f
the bladder by the artificial anus. More lately Mr
has achieved a similar success in a case in which t
was believed to exist low down in the colon. It is re
the same *Transactions*, vol. xlix. pp. 66 et seq. The p
determined, if possible, before operating, is whether
munication exists between the small or the large int
rectum, and the bladder. If it is in the descending
below, urine will probably issue at some time or an
rectum ; if the small intestine is the seat of ulcera
opens into the bladder, no urine can be expected to

he bowel. In favourable cases, then, this proceeding should ertainly be adopted.

Hypertrophy and sacculation of the bladder, dilatation, &c.—The muscular walls of the bladder become hypertrophied in most ases of obstruction to the outlet. Increased force being neces-ary to expel the urine, the organic fibres are augmented in roportion to the action required. Hence the vesical coats may e seen rugose and columnar, resembling in appearance the left ntricle of the heart; and they may reach half an inch, and metimes even an inch in thickness. From the interlacing of e fibrous bands which constitute the parietes of the bladder, often happens, when hypertrophy exists, that the mucous mbrane is forced by pressure into the interstices between, and at gradually sacculi are formed. These at first are very all, but if the action is continued and powerful, they become ge in size, protruding, in the form of tumours, beyond the riphery of the bladder, and forming additional reservoirs for e urine. A sac, or sacculus, may thus sometimes attain the

Fig. 283.



large sac projecting from the right side of the bladder. The communicating orifice just admits a common quill. Cause, long-standing hypertrophy of the prostate, the thin portions seen to be enlarged below. *a*, prostate gland divided. *b*, cavity of sac laid open.

inflammation.

In addition to hypertrophy, the wall times thickened by an interstitial depc mation ; a circumstance which impai the muscular action of the viscus. Ve is simply dilated, and even distended, the walls being thinner instead of thi condition occurs, not in stricture, but i prostate where, by reason of the size c plicating the muscular apparatus at th viscus is incapacitated from contract distension. Hypertrophy does not muscular action is impossible, or nearl

Vesical hœmaturia. (See Hæmaturia,

Tumours of the bladder.—These affec follows :

1. Fibrous growths, of a warty and
2. Villous or vascular growths.
3. Epithelial growths.
4. Malignant growths.

1. *Fibrous growths* are rarely met wit preserved in our museums indicate th here. They are non-malignant in cha

, protrude, and assume a polypoid form. A single
ical preparation may afford examples of all stages of
ment between the earliest elevation and the fully formed
id tumour. There is no analogy whatever in origin or
re between them and the uterine growths ; nor between
nd the polypoid outgrowth, which is frequently found
ng from the posterior part of the prostate.

symptoms are those common to all forms of obstruction
turition, added to the special signs of foreign body in the
r. Careful sounding may detect their position and form,
ill prove the absence of stone. The complaint is most
t in children and young people. Unlike the villous and
lignant growths, they rarely give rise to blood in the

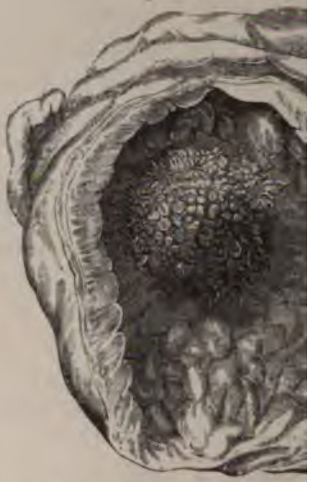
tment.—No special curative treatment is applicable in the
ubject of these growths ; much may be done to palliate
mptoms and to support the powers of life, by adopting
neans which are fully detailed in considering the effects
truction under the heads Stricture, Enlarged Prostate,
ronic Cystitis. In the female, a growth of this kind has
emoved by ligature, the urethra easily admitting the
te degree of dilatation.

illous growths.—These have usually been classified as
nant,' but have no claim, either by their structure, their
, or by the presence of constitutional cachexia, to be so
ered. The villous growth of the bladder is a soft,
ent body, about the size of a large marble when fully
ped, made up of innumerable villous processes, floating in
and branching off in every direction from the base, which
nected solely with the mucous and submucous tissues.
villi are identical in structure with the villous processes
chorion in its normal state, and are very vascular.
l such tumours may coexist in one bladder; and the
or a large portion of the mucous lining of the organ may,
ly examined, be found more or less studded with small
processes, similar to those of the tumour itself.

symptoms have nothing special to distinguish them from
f other tumours, excepting the frequent or almost con-
ppearance of some blood in the urine without provocation.
, death occurs rather from hæmorrhage than from ob-
on in these cases, as well as in part from the exhaustion

spasmodic action of the bladder, to

FIG. 284.



Villous growth. From a specimen in

internal remedies, and to counteract
by chalybeates and nutritious diet.
carefully introduced into the bladder
acetate of lead or of nitrate of silve
however, not to be repeated more t

case the symptoms resembled those of stone, only that the slightest
of movement produced bleeding, in the later stage. Injections of nitrate
r, from the half of a grain to one grain to the ounce, controlled this ten-
emarkably, and enabled him to walk a mile or two without hæmorrhage.
eath the same deposit was found in one kidney. (*Path. Trans.* vol. xviii.
-4.)

Malignant disease of the bladder is more frequent than the
hs just described. Sometimes it is primary, commencing
endently in the bladder; at other times it is secondary,
ding from the prostate, from the uterus, or from the
n. The species may be scirrhous, but is usually encephaloid
originating in the bladder; always the latter when
ling from the prostate; when from the rectum, it is
only scirrhous; from the uterus, the same, or epithelioma.
d is said to have existed, although it must be extremely
The disease generally runs a rapid course, and presents
onstitutional characters significant of malignant action.
ses of encephaloid a large mass is soon formed, which
imes almost fills the cavity of the bladder.

nptoms.—One of the most strongly marked signs of this
ion is hæmorrhage into the bladder, generally occurring
nly and in large quantities, rather than by frequent or
uous oozings from capillary vessels, which latter mode is
characteristic of villous growths. The pain is also very
and lancinating, and is referred as much to the loins,
and thighs as to the pubic and perineal regions. All the
of obstructive disease and chronic cystitis are present.
itutional cachexia accompanies the local disease in its
ced stage; glandular enlargements are usually distinguish-
n the iliac regions; and the patient suffers from loss of
and rest. Small portions of disintegrated tissue and
sanies are often voided from the bladder; occasionally
nay be found in the urine, which, when examined by the
scope, seem to indicate the specific character of the dis-
but the diagnosis is generally tolerably clear without the
vhat questionable support which is to be derived from this
. Without in any respect undervaluing the utility of
scopic examination, I am compelled to conclude that too
stress must not be laid on the indications which cell-
hs in the urine afford in respect of the presence of
nant or non-malignant disease in the urinary passages.
large masses of soft growth however, are frequently

passed, made up of large cells with more than one nucle
diagnosis of cancer is strongly confirmed.

The principles of *treatment* vary in no respect from
which have been laid down under the head of villous tu
Opium in some form, administered both by mouth a
rectum, and occasionally by injection into the bladder,
great value in alleviating the severe suffering; and must
be given towards the later stages of the complaint with
freedom. In all those complaints of the urinary organs
little or nothing remains to be done but to alleviate pai
support the powers of life, the remedies necessary sho
given with no sparing hand. So severe is the anguish
the patient suffers if left to the action of his com
unchecked or only partially checked by anodynes and
thetics, that it must be regarded as cruel to deprive
their aid in mitigating his distress, so far as they can be
available without danger to life; while at the same time
holic stimulants are in some cases scarcely less valuable
opium in enabling him to endure the progress of his mala

Tubercle of the bladder.—One of the rarest of the affe
of the bladder is tubercular deposit; probably it never
unassociated with tubercular disease in other parts of the
indeed in almost all—perhaps it may be said in all—
other parts of the urinary system are similarly affecte
these are generally the kidneys and prostate. In women
been found to have followed primary disease in the uteru
disease commences by a deposit in the coats of the bla
small tubercles; these become numerous and coalesc
sequently the morbid material softens, the mucous me
gives way, disintegration takes place, and a ragged ulcer
a large extent of the inner coat being sometimes d
before death.

The symptoms of this disease are not peculiar,
diagnosis depends rather on negative than positive sign
absence of much or frequent hæmorrhage may serve
tinguish it from malignant and villous tumours. Gr
and extreme irritability, frequency in making water, the
of calculus or other foreign body in the bladder, as as
by sounding, together with the presence of tubercle el
and progressive emaciation, and lastly the patient's age

or middle adult life, will serve to indicate the true cha- r of the disease.

eatment—That which is adapted for constitutional tuber- is in relation to the general health. For the local laint, anodynes, the remedies for chronic cystitis, rest; and echanical interference when the diagnosis is tolerably clear.

r at the neck of the bladder.—The enlargement of the tate, common in old age, often produces an elevation of the tures, sometimes amounting to a distinct ridge, which s at the inferior aspect of the neck of the bladder. A bar be thus said to be formed there; nevertheless, it has not usual in this country to apply that term to any product of nlarged prostate; it has been thought more desirable to ve it rather to denote any bar which may exist in the spot ibed, but which is not prostatic in its character. Such occasionally exist, and usually in elderly subjects. Mr. rie was the first to point out this fact. He believed the o consist in disease of 'the elastic structure,' existing at eck of the bladder, and as such to be quite distinct from ery common complaint already referred to. After con- ble study of this question, I cannot but consider the rostatic bar as extremely rare, since almost all permanent uctions at the vesical neck are due to enlargement of the l or to its effects; nevertheless, in very exceptional in- es the bar in question is undoubtedly to be met with.

all long-continued diseases of the urethra and bladder it is non to find a hypertrophied condition of the uvula and iated muscular fibres, and more or less elevation at the of the bladder, or bar, as its consequence; but this is not regarded as an example of the disease in question.

e treatment mainly consists in combating the symptoms of ic cystitis which may arise, and occasionally passing a catheter, so as to insure a patent condition of the neck of ladder. Mr. Guthrie and others have proposed to divide ar by incisions; but the rarity of any true barrier here, from prostatic enlargement, will induce extreme caution irming positively the presence of this affection during life, any severe surgical operation for its relief could only be mplated in presence of very serious symptoms as its un- ted effect. The subject of operations for relief of obstruc- at the neck of the bladder is considered at the close of

the section devoted to treatment of the enlarged prostat
age.

Hernia of the bladder is a rare affection, liable to occur in
sexes: in the male, as inguinal; in the female usually as vag
hernia, although it may be femoral. In the former it gene
forms part of a large mass occupying the scrotum, pressu
which sometimes evacuates the portion of urine which is li
to be retained in that situation, the bladder occupying in p
the pelvis, and in part the scrotum. It may be associated
a hernial protrusion of bowel, or may exist independently
this. In the former condition it has been met with in
operation for strangulated inguinal hernia, and has even b
opened by mistake, as in one of the two cases recorded by P
The portion of bladder forming the hernia always escapes fr
beneath the peritonæum, and consequently is never fo
covered by that structure. In cases which are detected ea
a truss may be successful in retaining the viscus within
pelvis; where permanent adhesions in the anomalous posi
have taken place, mechanical support is to be applied to prev
further protrusion.

Inversion of the bladder.—This is an exceedingly rare af
tion, and is found exclusively among female children. Th
cases only have come to my knowledge;* their ages when
seen were from two to four years, although the condi
probably commenced at a very early age. The bladder
gradually prolapsed and protruded through the urethra, w
becomes much distended, until the viscus presents the
pearance of a pyriform, red, and vascular tumour. One of t
cases narrowly escaped the application of a ligature, on
supposition referred to; but on careful examination the ori
of the ureters were discovered, and reduction was accompli
by manual pressure. Considerable incontinence existed
sequently in the two former; but in the third it occurred t
surgeon (Dr. Lowe, of Lynn) to apply a heated iron t
urethra (in all five times), and to maintain a silver cat
with a bulbous extremity in the bladder, between two and
weeks; by which means the viscus was maintained in its
and cicatrisation of the dilated canal ensued. The bladde

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* *Lond. Med. Gaz.* 1833, Jan. 19; *Trans. Prov. Med. and Surg. Asso*
by Mr. Crosse, with plate; *Lancet,* 1862, vol. i. p. 250, by John Lowe,

ed subsequently to retain some ounces of urine, and slight tinence only remained.

onditions which do not necessarily involve organic structural changes, appreciable by known methods of observation, and which are generally associated with some injury or derangement of a nervous centre.

ralysis of the bladder.—One of the most common terms in relation to complaints of the bladder is paralysis. Yet paralysis of the bladder never occurs without some lesion ıervous centre; so that the word is often incorrectly em- d. For example: the bladder when unable to evacuate ontents from obstruction by stricture, or by prostatic en- ment, or by atony from over-distension, is commonly said ' paralysed,' although there is no derangement of the us supply; to which condition the use of that term ought, ordance with our employment of it elsewhere, to be limited. ladder may possess its normal contractile power, but be e to overcome an abnormal obstacle in the outlet, and so o expel its contents; the complaint in this case is not ysis of the bladder, but solely obstruction in the channel it—two totally different conditions. This distinction must arly kept in view in our consideration of this subject.

ıe paralysis of the bladder is a condition in which the actile power of its muscular fibres is lost or impaired from e of nervous supply; thus there may be partial as well as paralysis. The usual cause of this accident is cerebral or l lesion. It happens in some injuries to the brain, in st all serious injuries of the spine, in softening, in apoplexy n all serious organic affections involving those parts of the ro-spinal system which affect the urinary apparatus. It s from spinal debility produced by excesses, especially of ual kind; also in temporary functional derangement of ervous centres; through the agency of reflex action from adjacent source of irritation, as in hæmorrhoids, and ially after operations for their removal; and after other tions; although in some of these cases the retention is bly due rather to spasm of the constrictor muscles than ralysis of the bladder. It may also happen after shock to ystem from any source, in fevers, &c.

ave met with a single case of permanent loss of power in ladder attributed to an overdose of belladonna. Certain

it is that the effect of hyoscyamus and belladonna is
to produce temporary paralysis; and in this m
combat undue irritability of the organ, for which
constantly prescribed. I repeat then that there
limited or local paralysis (the temporary conditions j
to only excepted) of the bladder, either affecting the
organ alone, producing retention; or of its neck alone
incontinence; or of the entire organ, the result of w
retention unassociated with paralysis of other part
Notwithstanding that such conditions have been de
regarded as common occurrences, the true pathologi
in almost all cases atony from over-distension, and n
(see next section).

Treatment of paralysis.—From whatever cause, th
is to empty the bladder, by means of the cathete
thrice daily. It should be employed with great ca
patient has probably lost sensibility, and cannot
complaining of pain, when injury is inflicted; while
is often in a lax state, and consequently a slight l
easily made. A full-sized instrument, either gur
whichever is found to pass most easily, must be em
signs of chronic cystitis manifest themselves, the
remedies must be employed, especially the local c
which washing out the bladder, followed by very mil
injections, may be reckoned as the best.

In cases not traumatic, or depending upon ac
strychnia, steel, cantharides, ergot of rye, and ars
a trial. Galvanism, cold douches, and blistering
be employed as local agents.

Atony from over-distension.—Organic obstruc
existed either at the neck of the bladder (enlarged
in the course of the urethra (stricture), during a
period, and having gradually augmented in amou
tractile power of the bladder becomes insufficient
the urine, and a portion is left behind at every ac
tion. This goes on increasing until, in some cases
so remaining, technically called 'residual urine,' re
or even thirty ounces; it then begins to open ou
the bladder, and some of it runs off during sleep, o
muscular efforts are made. The fibres of the blad
equal to the task of expelling the urine through
channel, and, not having been permitted to resum

ition of complete contraction, are over-stretched, lose their
e, and, even on the obstruction being removed, cannot expel
contents of the viscus. A similar state may be produced
n no organic obstruction is present, from long-continued
ntion of urine exerted voluntarily, or occasioned by tempo-
spasm, or by some cerebral affection, in fevers and the like.
patient whose bladder has been thus over-distended often
s himself unable to empty it subsequently. Such is the
ition termed here atony, and often falsely called paralysis,
ready noticed in the preceding section.

eatment.—It is essential, in the first instance, to insure the
plete emptying of the bladder for a time, at least once or
e daily. The muscular fibres must be enabled to resume
normal condition of contraction from time to time; and
never can take place unless the bladder is artificially
tied. Sometimes, if the over-distension has not continued
long, they gradually regain their tone, or at least recover
h of it. When the abnormal state has existed long, it may
ften greatly benefited, but is rarely completely removed.
hout the mechanical aid all medical treatment is absolutely
ss, but it may perhaps be useful in combination with the
er. The general and local stimulants of nervous action,
dy advised in paralysis, should be employed in this affec-
also. The cold douche over the lumbar spine and on the
men is sometimes particularly useful. Injections of cold
r into the bladder itself are the best of all direct applications
e viscus.

ritable bladder.—This term is often very loosely employed
esignate some specific affections of the bladder. Like the
'dropsy,' 'irritability of the bladder' denotes nothing
e than a symptom; in either case the real cause must be
vered; the terms themselves conveying no meaning beyond
simple fact, in the former case that a collection of fluid is
ent, in the latter that the patient passes urine too frequently.
ability of the bladder is a symptom present in almost every
tion of the urinary organs, from childhood to old age; and
named here at the head of a section solely on account of
conventional misappropriation of the term, and as affording
pportunity of protesting against it. Nothing is more
non, even in professional communications, than to be
d what is the best remedy for 'irritability of bladder.' It de-
s no special pathological state, and always requires to be con-

sidered in connection with the ot
with it, before a diagnosis of the e

Spasm of the bladder denotes a
is less frequently misapplied. It
of the bladder are involuntary, u
painful, the cause usually being
growths, &c. As in the preceding
it is often employed to denote a s
disease has not been discovered ;
citing cause may be predicated as
whatever the cause may be, by ge
thetics, and antispasmodics, as de
ment for cystitis, prostatitis, and s
it is liable to coexist.

Perverted sensibility of the nec
There are a few cases of severe
which neither researches during
have revealed the nature of the
remark that the number of insta
in practice, diminishes in direct
skill in diagnosis which is broug
Usually the patient complains of
those of stone, but repeated soun
any other deviation from the nor
urine is healthy, or at most only
undue action of the mucous memb
aggravate the symptoms, someti
air and scene often produce an im
only temporary. By careful inves
liver, early stages of renal diseas
commencing cerebral changes la
found to account for some cases ;
apparently inexplicable. Such h
better or more certain knowled
of the neck of the bladder. Th
to improvement of the general
of attack, if such be present, is ge
Palliation of severe pain is to be

Incontinence of urine.—An inv
bladder may occur under two w
first, during sleep only, in young
itself when the control of the

in adult subjects of all ages, when the bladder is already istended with urine, a certain quantity, which usually a very small proportion to the quantity retained, running her during sleeping or waking. The following rule almost ably holds good: in juvenile incontinence there is no re- n of urine; in adult incontinence it is present to a serious t. There is no principle more important to remember in eatment of diseases of the urinary organs than this, viz. n *involuntary flow of urine in the adult indicates a distended empty bladder.*

Incontinence in childhood and youth.—This is a common ometimes a very troublesome infirmity, affecting patients ally under the age of puberty, although occasionally it ues during some years after that period. The single om is that, in the middle of the night or towards early ng, the child wets the bed without awaking, and the act be repeated once or a greater number of times before . Sometimes this occurs every night; sometimes there is terval of one night, rarely of more. The patients so ed do not appear to belong to any particular temperament, be necessarily weak and cachectic. In some the failing ply a habit resulting from want of management, such as cting to take up young children once during the long l which is necessary to them as a night's rest. In such careful attention to habits and diet may arrest the infirmity. ny cases, however, no ordinary management succeeds, and al aid is sought.

umerable remedies have been given, and with a very al success. Small doses of cantharides and of strychnia, with or without iron, are sometimes employed. Tincture n alone, or the vinum ferri, has sometimes proved success- Blisters to the sacrum has been a favourite remedy; also louches to the spine, and general tonic treatment in most In my own experience, nothing has afforded such good s as belladonna. I have employed it in the form of ex- commencing, according to the age of the patient, with ixteenth to the eighth of a grain twice a day, and increasing lose if required as far as it can be safely borne. It is sary to add, that disappointment has arisen in the use of remedy from the impurity of the drug; it is absolutely sary to employ a pure extract. After failure with a pre-

paration from one source, I
obtained from another.

In cases of extreme obstir
a solution of nitrate of silve
prostatic portions of the uret
remedy is also easily applic
urethra in the female.

In no cases is it desirable
prevent micturition. Eithe
named, or by the improveme
included the removal of wor
irritation always to be look
may generally be attained s
ance is occasionally necessar

2. *Incontinence in the adult,*
in the vast majority of case
urine; the cause of which n
cystitis, stone, atony from
Very rarely does it happen i
from the bladder as fast as
Hence it is a cardinal princip
runs off incontinently, a cath
the amount of retention pr
female, true incontinence is
caused by a traumatic injury
impaired or destroyed the spl
from pressure in labour, or f
move the child, from over-dis
calculus, &c.

In regard to the treatment
to recapitulate that which is
tions above mentioned as cau
from the bladder, since they
various headings. When tha
true incontinence, maintain
empty state, is really present,
some perverted action of the
rare form of prostatic enlarg
in question does occur. S
organic disease to be found in
centres alone can be held resp

igation of the cerebro-spinal system must be instituted, ome other sign of lesion of that system will probably be ered, in which case the treatment must consist in that the general affection indicates, together with the employ- of some local appliances suited to protect the patient from sagreeable results of his infirmity, such as a well-adapted . Where incontinence results, as occasionally happens, mere functional derangement, caused by debility from ses, the cure will be effected by any means of a tonic cter which can restore normal tone to the spinal system. his object the preparations of steel and zinc, of strychnia, er with quinine and other vegetable bitters, are of value. tious diet, cold sea-bathing, and abstinence from the s of debility previously acting, form also a part of the nent for these cases. The local alteration of structure, does occasionally give rise to the incontinence just bed, is a form of enlargement of the prostate, in which osterior portion, commonly called 'third lobe,' is much trophied, and projects forward in the manner of a wedge en the two lateral lobes, so as to open out the neck of the er and render it constantly patent; instead of projecting ards into the cavity, as almost invariably happens, and ng a species of valve which prevents the outward flow of The former condition permits the bladder to remain ntly empty, and the organ becomes small in capacity. atter maintains it constantly filled with stagnant urine, the catheter be employed to remove it, and produces a l and capacious bladder. The treatment of the former ion consists mainly in providing a urinal; nothing in that can be done to modify the form or condition of the ed prostate, beyond that which is effected in preserving d a state of the general health as circumstances admit.

itual engorgement of bladder, and overflow of urine.—These more correctly describe the conditions met with in the ity of cases in which urine passes involuntarily than that aralysis,' so commonly used, and already referred to at . Urethral obstruction from enlarged prostate, or stricture, existed for a certain period of time, the bladder becomes to contract with sufficient force or continuance to over- the obstacle and empty itself; so that a certain portion of ine always remains after every act of micturition. This of the bladder to contract fully, when once established, becomes gradually more marked; the remaining quantity of urine becomes larger; the viscus is habitually engorged with fluid, its coats are thinned, distended, and atonied, its neck is dilated, and as this permits a portion to run off irrespective of the patient's will, brief temporary relief is afforded. This overflow occurs first during sleep, and subsequently from pressure of the abdominal muscles when any efforts inducing their contraction are made. Unless this state of things is remedied by proper treatment, the result is, sooner or later, chronic inflammation of the bladder, with a tendency to spread upwards to the ureters and kidneys.

The treatment of engorgement and overflow consists in emptying the bladder from once to three or four times in the twenty-four hours, according to the necessities of the case, and in using those remedies which the amount of chronic cystitis, almost always present to some extent, indicates to be necessary (see Chronic Cystitis, p. 889).

Retention of urine (see Stricture).

THE PROSTATE.

Malformations.—There are no special malformations to be noted here, except such as are involved in the condition called 'extroversion of the bladder,' which see (p. 881).

Injuries (see vol. ii. p. 735)

Inflammation of the prostate (*prostatitis*),	acute, chronic.

Abscess of the prostate.
" periprostatic.
Hypertrophy and simple tumours.
Atrophy.
Malignant disease.
Tubercle.
Cysts.

Acute inflammation of the prostate.—This affection rarely exists alone, but is generally associated with inflammation either of the urethra or of the bladder. It may be secondary to cystitis, and often is so; but it more frequently owes its origin to gonorrhœal inflammation, which has extended unchecked to the prostate, and it may be to the bladder also. Sometimes, however, it happens apparently as a purely idiooccurrence, and not by extension through continuity of This idiopathic inflammation, excepting the cases pro- by violence, as by instruments, &c., is probably extremely

ses.—These are: the pre-existence of acute inflammation urethra from any cause, but especially the gonorrhœal; re of the urethra in an aggravated form, giving rise to mation of all the parts posterior to it; the application to state of strong injections, cauterisation, the passing of , and mechanical violence of various kinds; inflammation bladder, and calculi. Cold and damp to the perineum ve rise to it, perhaps most frequently in gouty and rheu- subjects. Alcoholic drinks may induce prostatic inflam- , urethritis already existing, but only on this condition. nate sexual excitement, under the last-named circum- s, is also an undoubted cause.

ptoms.—At first, a sensation of weight and fulness about tum and perinæum is experienced, with some pain and ness at the neck of the bladder. The patient wants to ater more frequently, and does so with much pain, lly at the close of the act. These symptoms increase; in becomes severe, shooting and throbbing, and almost nous; a sense of great tension is experienced, and the nd perineum are tender when pressed. Pain in the back ins, and often in the thighs, is complained of. Movements body become painful, as does also the sitting position. t of relieving the bowels at stool produces considerable s; and a finger introduced into the rectum encounters tion; the anterior wall of the bowel is prominent, hard, t, and the outline of the prostate may be traced, much than in the natural state. An attack of piles may be d, the close contiguity of the hæmorrhoidal and prostatic avouring this result. Should a catheter be passed, the complains of excessive pain when the instrument reaches static part of the urethra. At a later stage, if suppura- s taken place, the rectal swelling becomes softer. Mic- n is often difficult, and may even be impossible, total on occurring from the obstruction produced by the swollen e. General fever accompanies these symptoms, com- g with rigors, and manifesting itself by all the usual during the acute stage of the disease. Pus usually s in the urine after a few days, and if there has been

abscess, a large quantity us
with great relief to the pa

Treatment.—In general
should be observed. The
arm, none to give mercu
antimony and full doses o
bicarbonate or acetate of
opened at the outset, and
afterwards. Local bleedi
outset than anything else.
be applied to the perineu
to six or eight ounces ma
should be taken, followed
and the patient be wrapt
be repeated with advantag
should not be used for m
rule. If retention of uri
once to hot fomentations
sized gum elastic cathete
relieved. The instrument
and is to be used again if

In the course of a few
subside, often, however, no
relapses. These are most
the part of the patient, eit
or erotic excitement. Wh
prostate still remains muc
of urine is not propelled w

Chronic inflammation.—
times enlarged, but not in
to the acute attack, perh
are: diminished force in
some gleety discharge; th
or less pus on standing, a
blood may follow. Ther
perineum and about the a
in sexual intercourse; and
and debilitating nocturnal
and all the symptoms are g
and by errors in diet.

Treatment.—One of the
tation of the perineum by n

ed for some weeks, and the surface dressed with simple oint-
t. Tonics and good diet, with attention to the digestive
ns, are almost always indicated; these latter being in fair
lition, iron is mostly beneficial; and as the bowels should in
e cases not be constipated, the iron should be combined,
n necessary, with some mild laxative. When nocturnal
ssions are frequent, and especially if they occur without any
ciousness whatever on the part of the patient, the applica-
of a solution of nitrate of silver, from ten to thirty grains
e ounce, to the prostatic part of the urethra, is one of the
means of treatment. To be successful, an efficient instru-
t is absolutely necessary, as well as care in injecting the
at the right spot: three or four applications may be
site. Let it be remarked, that we are by no means to
the existence of chronic prostatitis because the patient is
ct to frequent seminal emissions. These occur frequently
altogether different causes, which, as they have no
ssary connection with disease of the prostate, need not be
er considered here.

hen enlargement only remains after acute inflammation,
odide and the bromide of potassium should be given for a
derable period of time. Conjoined with or following this
ment, a course of tonics, steel and quinine, with sea-bath-
nd generous diet, often effects a great improvement and
letes the cure.

scess of prostate.—Acute inflammation, when neglected, or
rring in a naturally weak or delicate constitution, may
lt in suppuration of the organ. This occurrence may be
ected when after the first week or two the acute symptoms
ot subside, when the pain and difficulty of micturition and
cation increase, if rigors occur, and the patient is very
less and feverish, complaining of tension and pulsation in
perineum or neck of the bladder. Fluctuation may be felt
rectum; or pressure in the perineum may reveal tenderness
fulness there. The natural course of abscess in the
stance of the prostate is generally evacuation by the urethra.
asionally it issues by the rectum, and this is perhaps as
urable, generally speaking, as through the urethra. It may
ollowed by a troublesome urethro-rectal fistula; but this is
. Generally the opening of the prostatic abscess into the
hra soon closes; but if this does not take place, the cavity

may long remain open.
giving rise to fresh absces

In treating a case pre
should watch for any e
forming in the perineum
once made boldly in the r
successful, the patient wi
is encountered, no harm
tension is probably effec
abscess has been accompli
has been distinctly felt th

The discharge of matter
is sometimes followed by l
abscess may arise here s
quently; generally result
stricture of the urethra.
matter has been dischar
happens that the cavity en
fresh irritation is mainta
destroyed; its capsule be
pus-secreting cavity. Som
side or lobe only, and some
in number; generally spea
death is that described. T
import, and its existence
There are present the symp
often hectic; and a highly
indicated. Injections of n
to the ounce, are sometime
desirable which gives much
the symptoms.

Abscesses supposed to
turned out to be situated ex
the envelope of the organ.
arise much in the same man
less serious import than th
prostate itself. The trea
does not differ in other pa
for prostatic abscess, prope

The organic enlargement o
trophy). This common a
sixty years of age; I have n

efore the age of fifty-four years. Chronic inflammatory ements may occur at any age after puberty; but the now under consideration is wholly distinct, both in and by causal relations, from such or any other inflam- state. It has been said to be the common inheritance age, but it is, on the contrary, a complaint which a very najority of elderly men escape. With the view of ascer- the relative frequency of its occurrence, so far as such ber of observations can be regarded as indicating it, I ed out with great care the prostate in forty-three elderly luals, the results of which inquiry are presented in the ng summary: Appreciable enlargement existed at the 32 per cent.; notable enlargement, causing symptoms life, at the rate of 12 per cent. The oldest individuals series were among the unaffected; including 1 at ninety, ghty-five, and 2 at seventy-nine years. Subsequent more ed researches by Dr. Messer and myself have but con- these results.

enlargement consists mainly of an over-development of tissues which enter into the normal structure of the itself. These tissues consist, first, of unstriped muscular nd the connective tissue always associated; and they t least three-fourths of the prostatic body: secondly, ersed among this structure are numerous branching lar tubes and crypts with their accompanying ducts.

rgement, or hypertrophy as it is commonly termed, may ermined by an abnormal production of the first-named ts alone, or with some of the glandular tissue interspersed; is latter may be fully or imperfectly developed. The eral lobes of the prostate may in this manner be increased r or six times their natural weight and bulk; or an out- may take place from the central part of the organ, in a rd direction, towards the cavity of the bladder, as a more rounded or pyriform tumour of prostatic tissue, and uting what is frequently, but not very correctly, called larged 'third lobe;' and this form is one of those most nly met with. Generally, however, every part of the partakes more or less in the enlargement.

in, while the tissues thus described may be generally eveloped throughout the entire prostate, it is very com- find independent, or almost independent, and isolated rs of the same material embedded within the prostatic re proper. On making a section with a sharp knife of a

prostate so affected, these
divided, and the portions ma
They are usually made up of
the prostate itself, but gene
element, and that, almost alwa
ment. Sometimes they are
fibrous cyst. The presence of
common in the enlarged pr
organ in advanced life, and t
containing organ somewhat
fibrous tumours bear to the

An example of greatly enlarged prosta
the fibrous tumours des

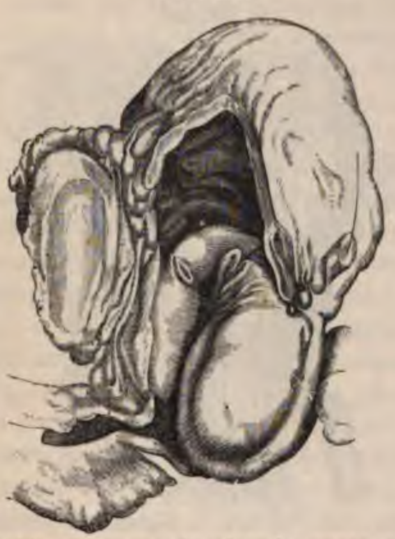
composed mainly of unstrip
other points of analogy in the

The most important result
the flow of urine. Its first
increase, sometimes consid
diameter; there is also dimi
diameter, the canal becoming
which, when distended, is o
direction. The length of the
increased, and it is often tort

ich I have examined, the urethra has measured four inches n the orifice of the bladder to the membranous portion, ead of one inch and a half, which is the normal length.

The natural direction also deviates: where there is enlargent of the median portion or 'third lobe,' the urethra suddenly s, producing an angular curvature in the place of a nearly ight line; so that a complete step has sometimes to be mounted at the neck of the bladder before an instrument enter the cavity. When, with this development of the

FIG. 286.



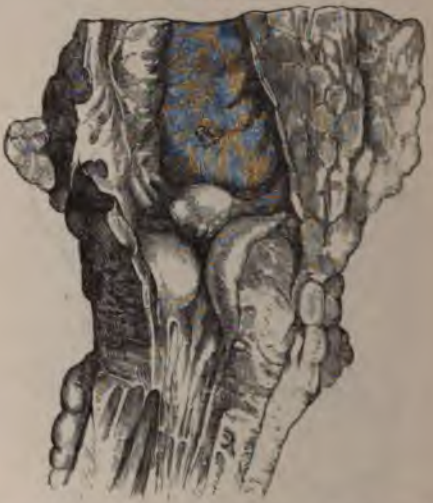
der, symphysis pubis, and enormously enlarged prostate; a portion is removed from the left wall of the bladder, to show the vertical ascent of the urethra as it enters the bladder.

dian portion, there is much enlargement of either lateral e, the lateral direction of the canal is also changed. Thus he right lobe predominates, there will be a lateral curve of urethra, the convexity of which is presented to the left, and *versá.*

The next deviations are those in the form of the internal tus, or vesico-urethral orifice. When the median portion dominates, this orifice has a crescentic form, the convexity which is directed upwards. When the right lobe considery exceeds in size the left, the crescent has its convexity to left side; and so on. In some preparations, where two or re irregularly-enlarged lobes are combined, the orifice is much distorted, presenting a tortuous outline. Someti overlapped by an outgrowth from the median portio form of a valve. In this case, which is not comm valvular portion appears to be forced against the nec bladder by the effort of micturition, and the obstruction still more complete.

The size and weight attained by hypertrophied pros sometimes remarkable. A prostate measuring two in transverse direction, and one inch in thickness from bef wards, or which weighs an ounce, must be considered

FIG. 287.



Hypertrophy of the prostate affecting equally the lateral lobes and medi typical example of the usual condition in a moderately advanced

trophied. On the other hand, a transverse measu three inches is not uncommon. I have seen one excee inches and a quarter; but such a degree of enlar extremely rare. The weight has been known to rea ounces. In malignant disease even these limits are e

The consistence of the organ varies, being sometim and harder in texture, at others a little looser and s in the natural condition. It usually presents the fo racter when numerous fibrous tumours are embedd substance.

Symptoms.—In the earliest stage of chronic enlar the prostate there is nothing to attract the attenti

ent, as it is probable that a considerable period is passed
veen the actual commencement of enlargement and the
rrence of any marked symptom. One of the earliest signs
erally observable is diminution in the force with which the
e is ejected, and the lapse of time which occurs before a
am is established. The size of this is not necessarily much
ller than it was in health, but it cannot be projected so far
the ordinary amount of effort. The desire to pass water
mes more frequent than natural, and the relief afforded by
act of micturition is less complete. On rising in the morn-
when the bladder has become distended during sleep, the
t occurs again in a few minutes, especially after the first
rt; and in course of time sleep is much disturbed by calls
pass water. A sense of weight, fulness, and uneasiness
t the perineum and rectum is felt, which the patient soon
rs to the neck of the bladder. As the expulsive efforts to
water become more frequent, irritation of the rectum
eases, the contents of the bowel are more frequently passed
inability on the part of the patient to prevent the act of
cation accompanying that of micturition; and tenesmus,
rusion of the mucous membrane or prolapsus, and hæmor-
dal swellings, are apt to result. Much stress has been laid
me writers, following J. L. Petit, on the appearance of
ened stools as an indication of enlarged prostate, but
inly without sufficient grounds. In some cases the motions
be passed in the form described; but this is caused by the
n of the sphincter ani, and not by the prostate. If the
plaint advances unchecked, the symptoms of chronic cys-
appear, and pains also sometimes in the penis and testicles.
sionally, some muco-purulent discharge from the urethra
served; this varies with circumstances, sometimes appear-
fter exposure to cold or damp, or with an attack of reten-
; while it may happen also that the irritation involves the
cles, which become tender and swollen. Vascular excite-
of the penis, producing frequent erections, is also at times
ncomitant symptom. As the complaint makes progress,
f to the bladder in micturition becomes less complete,
the enlargement gradually closes the neck or urethro-
al outlet, and the bladder is never emptied, a certain
on of its contents only being expelled at each act of mic-
ion. These difficulties, if unrelieved, inevitably increase;
apacity of the bladder yielding to the constantly-augment-

ing pressure upon it.
habitually filled, and the
micturition. At night,
by sleep, urine drains a
patient. This condition
nence,' but a better ter
condition in which the bl
should be looked for in s
on percussion above the
which it extends; it is son
although more frequentl
fingers' breadth above th

As the complaint adva
and he is the subject o
slight irregularities, or e
duce extreme distress
occasioned. Attacks of
these occasions, and th
impaired through the lo
charge of their secretio
mon, and sometimes rel
exposure to cold, sexua
which tend to produce a
viscera.

The characters present
decomposition of some of
tion, mixed with the pro
bladder. More or less
lower part of the vessel,
face, which is sometim
mucus increases in qu
tenacious, slimy, adhesive
with chronic inflammati
exhibits traces of phosp
tence and whitish colou
there is sometimes depos
layer of pus mixed wit
varying quantity. In a
may be darkened in colo

The chemical reaction
alkaline in various degre
ammoniacal, often fœt

cters are influenced to some extent by the quantity l, which often varies considerably in the same patient day to day; the measure being sometimes below, but generally much above, the natural or healthy standard.

a result of long-continued disorder in the urinary appa- and of the changes in the urine itself, which have been described, it is not surprising that the formation of us sometimes takes place. Its presence will be suspected re is much pain about the neck of the bladder at or ing the act of micturition; if the pain at the end of the is unusually severe, and if the blood and pus are very ntly observed, and especially if fragments of calculous r have from time to time been passed. But the existence culus is often wholly masked by the prostatic disease, se the conformation which the neck of the bladder assumes s affection tends to prevent the most distinctive symptoms ne; inasmuch as the foreign body is less liable to be ed in the vesical neck, but lies back deeply behind the ed prostate.

ot unfrequently happens that symptoms of enlargement ong before the real cause is suspected: the frequency of rition suggesting that there is undue freedom rather than ction to the act. The real malady is unsuspected, and reatment is directed only to those symptoms which been productive of most discomfort or anxiety to the t; to some febrile condition, it may be, resulting from dden cause. The march of events, however, must ulti- throw suspicion on the state of the bladder; a catheter ed, and, greatly to the astonishment of the patient, some or forty ounces of urine, or even a much larger quantity, e drawn off, notwithstanding that the act of micturition en just performed. And it occasionally happens, dur- e prevalence of such a state, that some unaccustomed in diet, or exposure to cold and damp, suddenly pro- congestion of the prostate, and complete retention, discovers the existence of the affection for the first

last stage of unrelieved disease is indicated more by the f a gradual decline of the powers of life than by those of ing obstruction; although sometimes the final symptoms se of rapid depression, after sloughing or ulceration of dder, and repeated hæmorrhage, or from great discharge

of pus from its cavity; r
failure of the eliminating

Diagnosis.—The test
surgeon is digital exami
pose, the patient shoul
surgeon standing on the
of his own left hand may
right hand is free to use
certed movements of that
finger in the rectum, mor
be obtained than by eit
The patient's knees being
each other, the finger sh
the sphincter, and when
two phalanges are free to
prostate may be defined.

If familiar with the
deviations will easily be
nation. We may first ob
ing enlargement, is it ge
lobes? and to what exte
the tip of the finger en
enters the rectum, and l
before it can be carried l
finding the yielding coa
when the finger is carrie
fulness and firmness ma
ment or outgrowth from
enlargement may not be

Next, we observe whe
equally so in places; wh
we can appreciate fluctu
tant consideration in a c
trocar. We observe also
on pressure. If inflam
extreme, and the mere i
distressing to the patien
be remarked also.

Lastly, supposing the
duced, we may, while h
municating to it gentle m
mative idea as to the thi

reen it and the finger in the bowel, and as to the situation direction of the instrument, &c., in the event of there being ulty in introducing it.

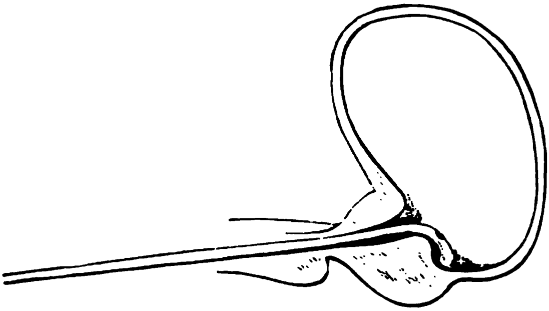
aving learned relative to these different points all that can ttained through the rectum, the urethra is to be explored. ll-sized catheter, of the form ordinarily employed by the eon, should be first used, because any phenomena presented ring from those observed when the prostate is healthy are at once made apparent. If by examination through the el no variation is found in regard of size, and the urine flows n the catheter has traversed not more than the ordinary nce, say from six and a half to eight inches, while the lle of the instrument itself has not required more than the nary amount of depression in order that its point may enter bladder, we may be satisfied that prostatic enlargement not exist; and we must seek for another cause of the ptoms complained of. But if the catheter has passed easily, for nine or ten inches, and still no urine flows; and if, in tion, while following its course, the handle has become than usually depressed, there will be little doubt in respect e existence of prostatic enlargement. The ordinary cathe- eing inadequate to reach the bladder, a prostatic catheter, h measures from two to four inches longer, and possesses rger curve than the ordinary catheter, may be employed. passes readily, the increased length of the urethra is easily rtained, and the direction of the prostatic canal is calculated the position of the shaft when the point enters the bladder. me few cases, while the beak passes through the prostatic of the urethra, the handle will be distinctly deflected to right or left, from which fact, if verified by two or three s, a greater degree of enlargement may be suspected to exist he side *towards* which the handle turns.

r the purposes of accurate diagnosis, we shall employ with ntage an instrument of a different form, viz., an exploring d with a very short curve at its extremity, or possessing a rather than a curve, which is shorter and more angular that of the ordinary catheter. By its means not only can y part of the bladder be searched for calculus, but informa- respecting the form and degree of obstruction at its neck also be acquired: see fig. 288. After the bladder has been rsed, the instrument should be gently withdrawn until the lies just within the urethro-vesical orifice, when, by turning it round to the right and left, the natural condition, exist, of that part can be ascertained; or, on the other h the presence of tumour or of stone, the depth of the f behind the prostate, and other relative points, can be de mined. A light, delicate, and practised hand is necessar its use.

This portion of the subject may be appropriately closed a few remarks on the diagnosis of prostatic enlargement f stricture of the urethra, vesical calculus, tumour of the blad simple atony or inertia of the coats of the bladder, and p lysis.

In stricture of the urethra, the stream of urine is invari small, in a confirmed case extremely so; in the prostatic a tion, though diminished in force, it is much less so in vol

FIG. 288.



The exploring sound, with short angular beak, for defining tumour, or disco calculus: in this case represented in a bladder with enlarged prostate.

than in the previous case. The use of a full-sized sound, ever, marks the distinction clearly. In stricture, obstru is encountered almost invariably before six inches of the in ment have disappeared, always before it arrives at the pros urethra. In enlarged prostate, obstruction is not encoun until seven, eight, or nine inches have passed, and not n sarily then, for, provided that the instrument be suffici long, it may pass into the bladder; but the handle has t depressed between the patient's legs in a manner not requ in the normal state. Lastly, stricture almost invariably m its appearance before middle life, prostatic hypertrophy until that period is passed.

In regard of calculus, while many of the symptoms are n to both complaints, the occurrence of sudden cessation of stream of urine, of severe pain at the close of micturition, exacerbation of symptoms, especially of pain and the earance of a little blood after exercise, may be looked upon strongly indicating the presence of stone in the bladder. it may exist in the absence of most of these symptoms, the first-named especially, from the circumstance that the ulus is usually situated behind the enlarged prostate, and s not approach the more sensitive region of the internal tus. The fact of small quantities of florid and unmixed d being occasionally passed after exercise, more closely roaches in value to a pathognomonic sign than any other. n the frequency of making water is greater at night in the static affection, but greater during the day when the se is calculus. A persistent discharge of muco-pus streaked blood should arouse suspicion. The use of the sound, ever, can alone clear up the case satisfactorily.

he existence of non-prostatic tumour of the bladder is less ly affirmed. Compared with prostatic enlargement, there uch more pain in the introduction of instruments, the e is frequently or generally mingled with sanious discharge flocculi, to which sabulous matter is often seen adhering. mination of these under the microscope may reveal the uliar structure of villous growth; or may demonstrate that se flocculent matters consist of organised structures, not of ganic materials, a fact possessing some significance.

imple uncomplicated chronic cystitis, with catarrh, is by no ns a common affection. Such symptoms are almost in- ably due to the presence of a foreign body, to some form of ruction, or to paralysis, or atony, depriving the patient of power of expelling the contents of his bladder, a condition ch is tantamount to obstruction. We may rely upon it, t in most of the obscurer cases there is a material cause, uently calculus; the presence of which needs a more than inarily searching examination to verify.

ingle or repeated acts of voluntary over-retention of urine sometimes followed by atony or inertia of the muscular etes of the bladder, and a state of chronic retention follows n their consequent inability to expel the vesical contents. condition resulting resembles much the retention produced enlarged prostate, and requires frequent relief by the

catheter in the same v
absence of physical sig
connection with a cause
the diminished power o
has been placed in the bla
are sufficient to distingu
should be paid to the las
the urine often flows wit
of the obstruction is rem
and the current can be a
patient, unless there be
distension; the atony, h
except in long-neglected
urine is not obstruction
barely flows from the cat
much influenced by any

Lastly, there is paraly
its nervous supply is eith
always associated with a
mities, and this may resu
encephalon or spinal cor
respecting its presence;
which catheterism prese
being introduced, the ur
parts around, the will of
its flow unless the abdo
condition, as in cases o
cord between the sources
to the bladder, in which
Otherwise no impulse is
of acts unassociated with
coughing, sneezing, and
sure is communicated to
is temporarily accelerate

Treatment may be rega

1. Treatment for the
obstruction caused by hy

The fact being discove
habitually retained in the
bly the efforts to evacuat
to ensure the complete r
least once a day. It ma

three or more times, daily, the necessity depending upon legree of obstruction, and the consequent amount of residual e. And if the power of urinating is almost or quite lost, it be necessary to employ the catheter as often as a decided t to micturate is felt. There are certain modifying circum- nces which must be taken into account; such as the facili- which exist for passing instruments, and the condition of urethra itself. If the patient possesses the ability to pass atheter easily for himself,—and it is very rare that he cannot ain it by tuition and practice,—he complies with the demands is case. He should be made to understand that, having his sensations to guide him, he may soon attain considerable terity in the management of an instrument in his own ure- a. But if this be in an extremely irritable state, which is ravated by the frequent use of the catheter, however care- y it may be introduced, it is necessary to consider carefully relative necessities of the urethra and the bladder, and some promise must be made between them. In most cases, the oval of the urine night and morning suffices to maintain reservoir in a tolerably sound and healthy condition, and it xtremely undesirable to resort to artificial aid with greater uency than is absolutely necessary to accomplish this. For use of the patient himself, and generally for the surgeon, ible instruments are, in the majority of cases, the better and r kind. When silver instruments are necessary, the curves n require to be larger, and more strongly marked than se ordinarily employed. Three good forms are shown in the exed woodcut. The fourth catheter is a flexible one, nted on a well-curved stylet to preserve it for use in its per form.

Vhen the necessity for a catheter is very frequent, some have ocated the plan of permitting a catheter to remain in the lder for days together. As a rule, this is not desirable, e irritation and even ulceration may be soon produced by instrument. Where, however, great frequency in making er exists, and ease and sleep are found to be promoted by the n, it should be adopted for twelve hours or so at a time; as ing the night, for example. In this manner it may be remely useful. But in circumstances of urinary retention, ch has been relieved with difficulty by the catheter, we may ustified in permitting the catheter to remain in the canal a considerable period. The vulcanised india-rubber catheter

has for some years beer
easiest for the patient, an
phosphates when tied in f
without a stylet sometime
often requires to be mount
withdrawn and the tube l
tain it there by passing a

the penis behind the g
catheter. If there is a te
overcome by applying a p
whole of the penis, and s
Holt appears to have e
the vulcanised catheter in
the attachment of 'win
ejection by the bladder.
which the vulcanised ins

uent is it to experience much difficulty in retaining it, in ch circumstances, if they arise, the winged catheter may haps be tried with advantage.*

he consequences of enlarged prostate already alluded to, the increasing retention of urine and habitual distension of bladder, which accrue from not completely emptying it y, form only a portion, although a very important one, of evils which can be obviated by the habitual use of the eter. It is impossible to overrate the benefits arising to patient from its use; and the responsibility which is rred by overlooking it should be ever present to the geon's mind in dealing with any signs of irritability of lder, or incompetence to retain perfectly the urine by patients dvanced years.

n relation to the treatment of chronic cystitis, catarrh, &c. ing as they so frequently do in connection with hyper- phied prostate, see the sections thus headed, pp. 889, 890.

. The general treatment of enlarged prostate.

t is of great importance to maintain all the functions of the y in healthy action, in treating patients who thus suffer. ght derangements in other parts of the system are very ne to augment the urinary symptoms. A simple catarrh, a of indigestion, or unrelieved constipation, are very apt to duce increased obstruction or greater irritability of the dder.

ll that tends to derange the stomach and bowels, to tax luly the digestive powers, or to over-excite the circulation, st be avoided.

he clothing and the habits should be such as encourage and intain a due action of the skin. Damp must be sedulously ided, or removed after exposure, especially from the feet, hout delay: the lower limbs should be kept habitually dry l warm; a habit of the first importance, as freedom of cir- ation and healthy vascular action here is one safeguard inst the recurrence of congestion in the organ.

he question of exercise is one of importance. The subject enlarged prostate must not be encouraged to believe himself much an invalid, but must exert his physical powers, as far they exist, in daily exercise in the open air, of which walking

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* *Lancet*, May 14, 1870.

is the best form. Riding is g
movement of trotting is undo
is often caused both by it and
or, indeed, after a long railwa
increased difficulty in micturi
healthy and natural state of
character, suited to engross t
patient, should be found, if p

3. Special treatment of the

Although many agents hav
pose, all medical treatment
efficiency, as to any power ex
the size of the enlarged organ
chlorate of ammonia have all
utility has been claimed for
that there exists very little
efficacious against senile hype
time seemed to promise more
employed by Mr. Stafford,
greater value than others h
His plan consisted in admi
the rectum, occasionally by th
the urethral surface of the p
ointment; commencing with
sium to the drachm of simple
twenty grains to the drachm,
quantity of iodine.

Regarding this as one of the
plishing the removal of gland
to infer that the hypertrophied
ably acted on either by iodi
over simple enlargements of
certain analogy between pros
has already been pointed out.
after ample trials of these drug
regard them as possessing an
in question.

The influence of compressio
morbid growths and enlargem
attempts have therefore been
the prostate. Physick, the Am
Leroy d'Etiolles, Mercier, and

liances for effecting this purpose. Dilatation by water in nding india-rubber tubes has been employed by myself. I not say, however, that any benefit is to be anticipated by of these means.

ivision of the obstructing portion at the neck of the bladder been performed. Other operations have been also atpted for effecting a similar purpose, such as the excision or crushing of a protruding portion; and even the ligaturing polypoid outgrowth. Respecting the division of an obction, bar-like in its form, elevated from the posterior er of the neck of the bladder, it is no doubt a proceeding accomplished without much difficulty, with the exercise dinary care. In most cases, although not invariably, the is a prostatic development, and when well marked may aps, in some cases, be incised with advantage, and without er to the patient. Such was the opinion of the late Mr. rie. I cannot say, however, that I have yet seen a case hich it has appeared at all advisable to practise such an ation. So much can be done by management, by maining the bladder in a healthy condition by means of the eter, that the case must be rare indeed in which such an ative procedure is indicated.

estimating these proposals, most English surgeons will be ent with awaiting further experiences in the hands of those have hitherto seen fit to adopt them. We can cherish e hope that any benefit will be conferred on the patient by methods of accomplishing the ends proposed, even granthat no doubt existed as to the possibility of carrying them execution.

trophy of the prostate.—The prostate is sometimes atrophied ld age, and occasionally it is so under certain circumstances arly adult life. It is but slightly developed in some malnations, and in constitutions in which the male sexual racter is not strongly marked.

he normal weight being about four and a half drachms, it ccasionally found as low as two and a quarter, and not equently at three drachms, at ages between 60 and 80 s.

here are no special symptoms of atrophied prostate, nor is special treatment indicated for patients who are the subjects .

Malignant disease of the prost
prostate is a rare affection; b
cases are lost sight of among th
to senile hypertrophy. The cou
well marked, it is impossible, with
from the last-named affection;
malignant growth arises in a p
of senile enlargement, the can
overlooked.

Judging from the data at pre
pears to be less commonly the se
deposit; the latter only will b
contrary is indicated.

Malignant disease of the prosta
loid. After a close examinatio
adhere to the opinion expresse
resulting at that time from an e
we now possess, viz. that 'the
true scirrhus of the prostate is d

Melanotic deposit is said to b
with encephaloid of the prostat
two cases; one at adult age, the
to be forgotten that interstitial
growth may be mistaken for tr
the naked eye it sometimes rese

Malignant disease has at prese
hood and at advancing age.
record between the ages of eigh
of the disease, from the first a
fatal result, appears to vary fro
in adults, and from three to nin

The symptoms of the maligna
to prostatic obstruction of any
themselves with greater rapidi
hypertrophy. Besides them, t
characters, such as more sev
occasional, often frequent, hæ
constitutional cachexia. The p
the region of the sacrum, and s
the anterior or posterior aspect.

Hæmorrhage is a common o
late period in the course of th

e time or another, sometimes to an alarming extent. The ood is usually voided almost pure or unmixed, and frequently ter some attempt to urinate, which has been attended with eater exertion than usual. Less commonly is the hæmorage continuous for some time, as happens in villous tumour, r example.

The enlargement formed by the prostate itself, when examined the rectum, is hard at first, and may or may not be irregular outline or consistence. Softening may in the later stages be t, but the patient's powers do not always sustain him to so e a period as that in which the growth either softens or gates. Consequently, on examination after death, the prote may be simply enlarged; or there may be breach of sure and protrusion of soft granulations; or there may be a of substance and a cavity, the last-named circumstance earing to be rare. Frequently other organs are affected, by no means invariably. But there are always diseased phatic glands adjacent, and sometimes the infection reaches e distant groups. The existence of such swellings in the rse of the iliac vessels, and sometimes in the inguinal region, frequently be verified by examination of the abdomen, and stitutes a valuable sign in relation to diagnosis.

The urine may be closely examined, in cases of a doubtful ure, for the presence of cells which may be regarded as manant from inspection of their forms and constitution. A good al of débris is seen in advanced cases, its presence indicating at the growth has fungated, and throws off portions of its ssue; and these will sometimes exhibit all the characters of a alignant growth elsewhere. It is not to be forgotten, however, at the urinary passages yield epithelium cells of all forms nd sizes abundantly, and these, I suspect, are mistaken someimes for the so-called 'cancer-cell.'

Regarding the general treatment of malignant disease of the rostate, nothing more can be suggested than applies to the mplaint when occurring in any other part of the body. The eatment is palliative, and must be regulated according to the cessities which arise in the progress of the case.

Thus, accumulation of urine must be provided against at the nallest possible risk of irritating, much less of injuring, the rt. If catheterism can be dispensed with altogether, so much e better. In no circumstances is it of more importance to be tremely gentle in the manipulation of instruments. The pain

must be relieved by anodynes administered both by mo
rectum. The addition of conium to opium, by enema o
sitory, is often useful; and by the mouth belladonna i
times a valuable auxiliary in mitigating pain, given in
from one-fourth to three-fourths of a grain twice or thr
a day. Hæmorrhage must be treated on principles
illustrated (p. 878). The powers of life are to be supp
every means in our power. Nutritious food, both in t
and fluid form, with a due proportion of alcoholic sti
must be supplied in accordance with the wants of the p

Tubercle of the prostate.—The prostate is very rarely t
of tubercular deposit, and when it is so, appears genera
somewhat increased in size, until the later stages of t
plaint are reached, when, after suppuration and disch
volume may become smaller than natural.

At no period of the disease is the prostate affecte
some other part of the genito-urinary tract being the
seat of the affection. In most cases the deposit tak
first in the kidney; the organ next commonly affected,
the genito-urinary group, is the testicle. In fourtee
collected by myself, tuberculosis of the kidney occu
eleven, and of the testicle in six: in seven of these c
lungs are stated to have been diseased, they were proba
nearly all. It is difficult to isolate any special sympto
cative of this affection. Undue frequency and pain in
water, occasionally blood in the urine, and at times
cystitis, are commonly experienced. The presence of pu
urine, of occasional hæmaturia, of pains in the loins, pe
and penis, give rise to suspicions of calculus, to be
sometimes only by a careful search; no foreign bod
found, the nutrition of the patient, his history, and t
dition of the lungs and other viscera, will probably l
correct diagnosis.

Nothing need be said of the constitutional treat
tubercular disease, and little in relation to the local ma
tion in the prostate. Mechanical interference is to be
and every kind of irritating application. If suppurati
the form of external abscess, it must be treated as oth
neal or ischio-rectal abscesses. But more commonly
charge of purulent and tubercular matter takes place
urethra. The improvement of the health, by all those m

ns which regulation of the diet, regimen, exercise, climate,
medicine enable us commonly to achieve in tubercular
ents, constitutes almost the whole of the treatment to be
loyed in the affection, when involving the urinary or genital
ns. The diagnosis once established, it is of great impor-
e that the patient should be kept free from all instrumental
tment, which, in such cases, provokes irritation, and aggra-
s the disease, without conferring upon him any benefit
tever.

sts of the prostate.—It is not at all uncommon, in making
ons of an enlarged prostate, to find cavities, of an irregular
, in its substance, not met with in the normal organ. These
ies have all the appearance of being dilated follicles of the
dular structure. Ducts are easily traced into them; and
ently numerous little dark concretions lie free within. I
seen from thirty to fifty of these minute bodies occupying
ity about the size of a grain of wheat or of a small pea.
t larger concretions, that is, of the size of pearl-barley,
l prostatic calculi, may occupy each a separate recess of its
; and on removing the foreign body, a spherical, thin, and
th-walled cavity is displayed. Sometimes hundreds of such
l cavities may be found in one prostate; but this is a very
circumstance.

he formation of these cavities, or cysts as they have been
d, depends a good deal on the prior formation of concretions.
ll events, the two occurrences are closely associated. We
w too little of either the one or the other to affirm anything
confidently respecting the precise mode of their formation.
t probably the cavities are nothing more than enlarged
cles, dilated cæcal terminations of the glandular tubes.
re are no isolated cysts in the prostate filled with fluids,
ing no communication with the secreting structures around,
n the kidney; no formation, indeed, which can be regarded
nalogous to that which may be considered as the type of
le fluid cysts. Although, in conformity with the practice
ther authors, I have referred to 'cystic disease' of the pro-
, the use of the term is scarcely warranted by the phenomena
nted; and if retained, it must be held to signify a forma-
of a wholly different kind from that which is indicated by
the breast or kidney.

e cavities referred to do not attain a sufficient size, nor, as

It is doubtful if hydatid cysts have prostate. Cases are on record in wh distension of the bladder occurred as *between the bladder and rectum*, near t but in which the prostate was not af Prostatic enlargement was very close some of them, and in two the prostat under the belief of its existence. A two have at times been regarded as off formed in the prostate itself. But I to show that they were so.

THE MALE URET

Congenital malformations.
Injuries.
Inflammation.
Stricture of the urethra organic.
spasmod
inflamm
Tumours of the urethra.
Urinary abscess, acute and chronic
Urinary fistulæ.
Retention of urine.

ontain the urine, nor any canal to carry it off; but a mucous nbrane, corresponding with the posterior surface of the lder and with the floor of the urethra, alone remains. further description, see '*Malformations of the Bladder,*' 81.

. The canal is sometimes occluded, and this produces reten- of urine, and death during the early hours of life. The truction may consist merely of a membrane forming a dia- agm across the canal, or of an obliteration of some lines in gth, and it may occupy any portion of the tract, but is ally found near the vesical orifice.

. Deficiency of a portion of the urethra near the anterior ice is the most common deformity. When a part of the er covering is deficient, and the mucous membrane of the er part, or floor, is exposed, the condition is termed *epispadias;* n the contrary condition is presented, the deficiency being of the floor, the term *hypospadias* is applied to denote it. degree of deficiency varies considerably; from a quarter of inch to an inch and a half may be absent in either case. asionally, and this is only a variety of hypospadias, a second tus exists, usually about an inch behind the normal one, ning externally through the floor of the urethra. But the ning may be much further back, and may even render im- cticable the ejection of semen into the vagina.

4. Besides these, slight exaggerations in the size or form of natural parts may be occasionally noted; as of the lacuna gna, the sinus of the bulb, and the sinus of the verumon- um. Not very unfrequently there is congenital narrowing the external meatus, or of some portion of the passage situated hin an inch of it.

reatment.—The simple diaphragm may be perforated by a car, or point of a bistoury, when its existence has been clearly ertained. The congenital narrowing of the external meatus y be dealt with as stricture in that situation. None of the er conditions, with one exception, are improved by the ious procedures, by paring and suture, which have from time ime been practised, nor are they sufficiently important to be reated. But hypospadias existing or extending far back, so to produce a practical impotence, should not, under some umstances, be refused the possibility of remedy by surgical ration. This has been accomplished by a combination, of forating the anterior portion of the penis, paring the edges

of the opened urethra, and uniting by suture. Muc
skill, however, are necessary to give the patient an
a cure.

Injuries of the urethra.—(See vol. ii. pp. 726 et seq

Inflammation of the urethra.—(See the essay on Go

Stricture of the urethra.—The term stricture i
unnatural contraction of the urethral canal, con
acquired. Contraction may occur in two forms:
nature of the first to be permanent, and of the sec
transitory only, as regards its duration. A p
contraction is due to organic deposit in or around
of the urethra, and is accordingly termed organic
nent stricture. A transitory contraction is sup
be due either to local vascular inflammation or c
causing temporary narrowing of some part of the
hence the term inflammatory or congestive stri
to unwonted muscular action alone, of the volunt
the involuntary fibres, in which case it is designated
stricture. This last-named condition, that of spasm,
alone, but is usually found as a complication of
kinds. The term spasmodic is understood to include
in which involuntary contraction of the muscular
stitutes the main source of obstruction. So also
inflammatory stricture can only be employed when
nished calibre of the urethra is mainly due to an
inflammation.

But the terms implying temporary stricture ar
cause confusion and misapprehension. Obstructed
from inflammation has its origin in the prostate wh
through an attack of that nature, and is improperly
stricture; just as we have tonsillitis obstructing degl
which is never spoken of as stricture of the throat.
micturition from mere spasm of the muscular pari
urethra must be excessively rare, although, no do
complicates previously existing morbid changes ther
prefer to restrict the term stricture of the ureth
narrowed conditions of the canal which depend
changes in, and immediately surrounding, its wall
words, I shall use the word stricture as synonymo

s organic or permanent stricture, and as implying nothing ͻ.

ıatomical classification.—Strictures present themselves in a ɜty of forms. For anatomical purposes all these may be nged in four groups, by which means it is easy to designate specimen, according to the physical characters of the ture itself. It will then be only necessary, for the sake of ıer description, to speak of it as more or less narrow, and ɐ the region in which it is situated.

Linear stricture.—The urethral canal may be obstructed by n membrane stretched across it, with an aperture in the e, or on either side of it, and having an appearance, in ion to the rest of the passage, somewhat resembling that e pyloric orifice of the stomach. It occasionally happens a fold of the mucous membrane obstructs the passage at of its sides only, forming a crescentic septum, and so ucting a segment of the calibre of the canal: these con-e what has been called 'the bridle stricture.'

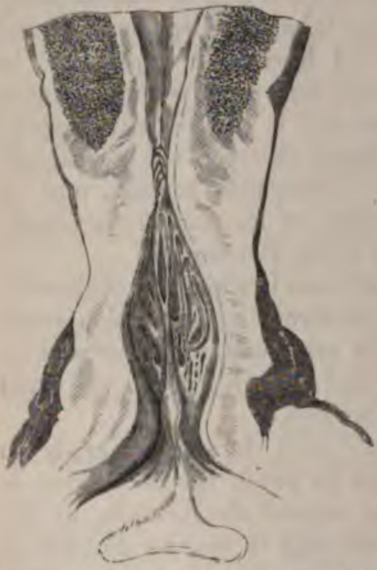
Annular stricture.—Those instances in which the contracted is thicker and broader than the foregoing description would de, have been termed annular strictures, which present an arance as if a piece of cord had been tied round the canal e point, leaving the remainder free.

Indurated annular stricture.—This term may apply to e cases of confirmed stricture in which the induration is to extend into the tissues around the urethra, to the h of half a line or a line: although it may be limited in nt from before backwards to a space occupying less than an inch of the canal. The centre of the space is the point which the contraction is most considerable, so that the ted portion presents a form somewhat resembling that of hour-glass; and it is worthy of remark that the induration generally thicker at the floor than the upper aspect of the thra.

. *Irregular or tortuous strictures.*—In a few instances, some he natural rugæ of the urethra seem to be adherent, or even ed together, for the space of a few lines in length. In very e cases a patch of indurated tissue is seen, resembling a trix, around which the mucous membrane is puckered in iating lines; the amount of contraction appearing to corre-nd with the extent of previous loss of substance. But occasionally the contraction extends longitudinally siderable distance, and the canal is narrowed, an thickened on all sides, for a length of one or more i these cases the induration sometimes involves the stance of the corpus spongiosum, and gives rise to obstinate and undilatable form of stricture.

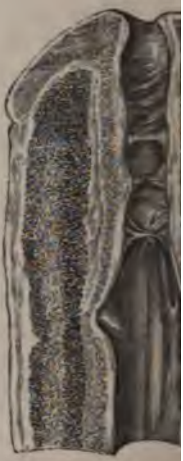
Occasionally several separate strictures may be o the same subject. John Hunter records an instanc he met with six strictures in one urethra. Lalleman

FIG. 290.



Long and indurated stricture at the junction of the bulbous with the membranous urethra. Much dilatation of the urethra and its lacunæ behind.

FIG. 29



An irregularly narrowe fecting the anterior urethra, the narrowe rather more than tw the orifice [drawing nature]. Dilatation and of lacunæ behin

French writers describe seven or eight. I have able to find any such examples. Three, or at the distinct contractions is the highest number I have the latter is rare.

Origin, nature, and site of stricture.—The first effect mation upon the mucous membrane is a swelling or of it, caused by engorgement of the vessels. Then ex an albuminous fluid takes place into the submucous perhaps becomes absorbed under favourable circumstan when the morbid action persists, more or less plastic own out,.the result of which is, the formation of fibrous around the canal, causing adhesion between the mucous rane and the submucous tissue, infiltrating the meshes e latter, and even involving the substance of the corpus iosum itself.

widely-differing condition to any of those above described een referred to by some under the title of stricture. Some- , but by no means frequently, an exudation-deposit upon urface of the urethral mucous membrane is said to cause sion of the canal. Few cases are on record, nor are examples to be found in our museums; and it is now certain that this condition must be regarded as extremely

eaking in general terms, the degree of contraction is pro- ned to the duration of the complaint, and to the extent of nflammatory action which has existed; although the ity of the symptoms, the amount of distress, and the effects he constitution, are by no means always commensurate the amount of narrowing which exists. It is very rare in- to find the urethra altogether impervious during life to ow of urine. However contracted the canal may be, the still issues either in a very small stream or by drops. ation does not depend on absolute organic impermeability. easy to conceive that when the canal is contracted to a pin-hole, the slightest cause may operate to occasion total uction; a little tumefaction of the part, a pellet of thick s, a flake of fibrinous deposit, or a very small calculus, are sufficient to block up the channel. Probably the sides e urethra never adhere, and cause obliteration of the canal; s indeed fistulæ have been established, when, although rarely, this accident may happen in that part of the canal h is anterior to the stricture. But even then it occurs st invariably in those strictures which are of traumatic n. The urethra may be cut across by a wound in the eum, and for want of proper attention the urine may pass ely through the artificial opening, and adhesion seal up the r passage. But such obliteration is a wholly different from stricture, and ought not to be confounded with it.

cality of stricture.—After a laborious investigation of this ct, respecting which there has long been much difference inion, comprising the examination of 270 preparations in our principal museums, I have arrived at the followi All examples of the disease may be comprehended, to this enquiry, in three distinct classes:

1. *Strictures occurring at the sub-pubic curvature,* junction between the spongy and membranous portic vicinity; the latter term comprising an inch of the ca and three-quarters of an inch behind, that point, thu the membranous portion.

That part of the urethra which is most frequent with stricture is the posterior or bulbous part of portion. The liability of this part to stricture diminish as it approaches the deep fascia, behind whic is very rare. Most rarely is a stricture found so far b posterior part of the membranous portion.

2. *Stricture occupying the centre of the spongy por* region extending from the anterior limit of the pre within two inches and a half of the external me measuring therefore about two and a half to three length.

3. *Stricture occurring at the external orifice, and distance of two inches and a half of it.*

The following is an analysis of the 270 preparatio to; they exhibit 320 distinct strictures:

Total number of strictures, 320:
„ in region 1 . . . . . 215, or 67 per cent. of the entire n
„ „ 2 . . . . . 51 „ 16 „ „
„ „ 3 . . . . . 54 „ 17 „ „
320

Of these

There were 185 examples of *one stricture only,* situated in region
„ 17 „ „ „ „
„ 24 „ „ „ „
There were 8 *cases* in which the urethra was strictured in all thr
„ 10 „ „ „ in regions 1 and
„ 10 „ „ „ „ 1 „
„ 13 „ „ „ „ 2 „

Respecting so-called 'prostatic stricture,' it may state that there is not a single case of it to be fou one of the public museums of London, Edinburgh, nor have I ever met with an example. It must be that some observers who describe prostatic stricture deceived in reference to it, or that it owes its supposed to inferences drawn from the results of examinatio ng body, which can by no means be admitted as evidence on e subject.

Causes of organic stricture.—There are two principal and tinct species of lesion which give rise to the formation of cture of the urethra. The first, and that which by far the st frequently operates, is inflammation in the canal; the ond is injury by violence.

The first-named process, viz. the inflammatory, in the great jority of cases, fortunately terminates by resolution, and leaves urethra as healthy as before. Whether the urethritis be orrhœal, or of non-sexual origin, that is the ordinary result. in exceptional cases, occurring in some instances probably n indiscretion on the part of the patient, in others from violent treatment, and in others from a constitutional indisposition erminate inflammatory action, this latter persists and produces the deposit which ends in stricture as before described. s last-named cause is not a speculative theory, for I am now e satisfied that in certain families individuals inherit a proity to the formation of stricture. It is not therefore acute orrhœa, but a persisting chronic or subacute affection, ch seems to lay the foundation of organic stricture. Hence ng period often elapses between the acute attack and the t symptoms of obstruction. These latter appear often very diously and slowly, and at first perhaps scarcely excite the ention of the patient. Thus it is that a period of many years ften passed before the existence of the organic change has ome obvious.

The next principal cause of stricture is mechanical injury. ws on the perineum, bruising, lacerating, or partially troying the urethra, are received in a variety of ways: by s on some hard object, as across spars, scaffolding, ladders, irs, gates, wheels, saddles, &c.; or on some sharp object ich punctures the perineum, as palisading and other fences, m earthenware vessels which break under the sitter, &c.; ain, laceration may occur from the bones in pelvic fracture; tly, all violence in the use of surgical instruments must be mitted as another traumatic cause. In all these cases the unded urethra often unites irregularly, or loss of substance kes place, and the cicatrix resulting permanently contracts e part. The strictures so formed are among the most stinate and difficult to treat which come under our care.

An occasional cause of stricture is cicatrisation following chancrous or other ulcers which ha substance. The results of these ar the external meatus. After amputa opening of the urethra is also sometime manner.

Narrowing of the urethra, occurring g inch or an inch of the external meatus, i as a congenital formation. It is remai up to the period of adult life without occa convenience, indeed without being disco become the source of severe symptoms. become in later life less extensible, and obstruction to the outflow of urine.

Symptoms.—Among the early sympton charge is often noted, and its presence true cause. Pain is usually felt in th stricture, at the time of micturition. bladder are emptied at shorter intervals The stream is altered in form, becoming perhaps twisted, spirting, forked, or eve ditions are caused by the current of wat size and force to dilate and extend th externus; but it must not be conclud istence of such a stream is a proof that many persons, from a tumid condition habitually pass such a one. As con stream grows smaller, the momentum and in time the urine may issue only speaking, the act of micturition is al extent corresponding with the degree Ultimately the acts of micturition bec painful, some patients being compelled t times in the course of the night; while during temporary exacerbations, a great spent in laborious and unavailing efforts or by straining, to obtain some relief. T is thus often induced, leading to prot membrane through the external sphinc troublesome prolapsus. In bad cases t attempt to empty his bladder without vis through his inability to prevent the esc the rectum from the efforts required for e perineum, the testicles, the loins, and the hypogastric n are usually present in such cases.

some few cases the most prominent symptom throughout tention. There may be but little irritability of bladder, the stream of urine, when passed, is not necessarily very ; a No. 6 or 7 catheter may pass through the urethra ; true organic stricture is present, and may perhaps be ed by the touch, as a ring of indurated material in the e of the urethra. The patient is liable to frequent reten- and finds no relief but from catheterism, while attempts latation are followed by inability, more or less prolonged, ss water, until an instrument of very large size has been ed.

e urine also shows signs of change, which become more ed in proportion as the case advances. A portion being ned in the bladder, from inability to overcome the obstruc- the secretion becomes partially decomposed, and irritates mucous membrane; and thus urine, cloudy, ammoniacal, lepositing as it cools a quantity of pus and mucus, is not nfrequent accompaniment of stricture. It is usually ine, deposits slimy tenacious mucus, and also a precipitate e prismatic crystals of the triple phosphate of ammonia magnesia, of exudation or compound granular corpuscles, elium, and some pus; while on its surface an iridescent or pellicle collects, commonly consisting of the triple phate, and sometimes of the phosphate of lime. Hæma- is also one of the occasional concomitants of stricture. d sometimes comes from the bladder, in small quantity, nunicating a dark tint to the urine. It frequently follows se of the catheter, but it appears also when no instrumental ference has taken place; or it may be due to the rupture ssels during erection, the urethra being unduly confined by presence of the stricture, and strained by the act (see naturia, p. 876).

s the case advances, attacks of complete retention, de- ing on the causes above mentioned, become more frequent. urine is at length habitually discharged by drops, so that eam cannot be said to exist. Sometimes the urine passes involuntarily during the unconsciousness of sleep, or ng muscular exertions; and at length the patient loses the er to retain it altogether. At this stage 'incontinence' is said to occur, which term does not here apply either to

an irritable or to a paral
capacitating it to retain its
been mistaken for this.
infects the patient with
precautions, excoriates the
him offensive to himself an
nine cases out of ten, indi
and that the surplus only r
organ remaining filled wi
unless it be frequently em
state of retention, or of engo
The extent of dulness on pe
this condition, and also the
distended viscus. Under
bladder is increased, and di
than before. Thus ulcerat
brane, or in that of the ure
such circumstances, in a pa
rupture of the urethra ma
urine occur into the cell
scrotum, and supra-pubic re

Besides the local sympton
order of the digestive orga
impaired nutritive functio
strength, looks anxious an
the back and loins, and o
attacks of shivering. Other
the passage of a bougie, or
larger than the accustomed
appears to be more comm
inhabited warm climates.
corrosive substance to the
followed by some general f
nomenon that it has rece
inappropriately, of 'urethral
first act of micturition follow
as if from contact of urine
the wound if incisions ha
intermittent in its character.
symptoms are more prone to
presence of such disease wh
slight urethral irritation in p

otherwise, to experience them, and who have suffered for
e time from stricture. I have observed, on more than one
sion, suppression of urine, rapidly followed by death, to
lt from the introduction of an instrument larger than the
ent has been accustomed to; or again, when the ordinary
rument has been less skilfully employed, and an abrasion,
ough only an exceedingly slight one, has been made in the
cous membrane of the urethra. The rapidity with which
th may occur, under these circumstances, in patients who
the subjects of extensive chronic disease of the kidneys,
n an apparently exceedingly trifling lesion so caused, is
arkable. It seems to be due to uræmic poisoning; the
t-mortem appearances, to the naked eye, do not necessarily
ibit traces of inflammation resulting from the particular
on. In these cases it appears that the function which
ermines the elimination of urea suddenly ceases after slight
ry to the urethra, as by the propagation of some shock to
excreting organ, in cases where the kidneys are largely
ased. And there are undoubtedly sometimes, although
ely, instances in which the fatal result ensues in this
nner from the mere passing of a catheter, although it is
olutely certain that no mechanical injury whatever has been
cted.

rom the symptoms which present themselves three classes of
anic stricture may be made, which will embrace all the
eties of the disease, and so serve as a means of describing
rief terms any particular example in the living patient.

. *Simple stricture.*—Its chief sign is diminution in the size
he stream; there is increased frequency of micturition also,
some pain, although the amount of either varies greatly in
rent cases.

Sensitive or irritable stricture.—Proneness to disturbance
he nervous system, as evidenced by chilliness, irregular cir-
tion, or even rigors on very slight irritation. Great pain is
sed even by the gentle application of instruments, and it
tinues sometimes long afterwards. In a few cases also a dis-
tion to hæmorrhage is manifested.

. *Contractile or recurring stricture.*—There is constant ten-
cy to become narrower in the absence of treatment; and
traction rapidly recurs after dilatation has been applied.

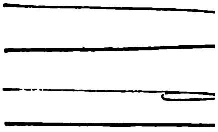
Diagnosis and treatment. Dilatation.—The symptoms just
ailed are not sufficient alone to establish the presence of

stricture: it is necessary to e
strument to ascertain whethe
whether one or more are prese
of the canal is involved.

For this purpose instrumen
tions are used: some are sof
others inflexible and solid. S
called bougies; others are hollo
and are termed catheters. As
whether hollow or solid, are le
the inflexible, and I advise t
They are of two kinds, each n
gum-catheter has a consideral
but is very flexible if placed in
retain when plunged into cold
cated when warm. This qual
in the treatment of enlarged pr
ment is required. Ordinaril
stylets, which maintain the de
is to be withdrawn from the c
of the same material are s
Formerly they were made of
have fallen into disuse, being

The French instruments ar
than the English, and may be
not taking any other form th
extreme flexibility enables th
without pain or even discomfo
even when solid instruments

Fi



Bulb-ended b

a rule, no instrument passes ei
urethra, provided the obstru
and tight, so easily and readily
French bougie, which tapers f
to the end, this consisting of

e of the instrument (see Fig. 292). The long and extremely
le extremity readily insinuates itself through the passage;
vere the instrument to end in a fine point, this might
ly be caught in some lacuna, but the terminal bulb pre-
this, and the merest tyro can generally pass it at once
he bladder. In doing so, if the patient stands, the bougie
oiled, is merely introduced and pushed horizontally
ds, without any attempt to direct its progress. The bulb-
l bougies and catheters, often but less appropriately termed
ary bougies,' are often of extreme utility both to the
on and to the patient who requires them for his own use,
hey are quite unsuitable to hot climates, where for the
part metallic instruments are necessary.

introduce the silver catheter, and supposing the patient to
y the standing position, the following plan may be adopted.
he handle or upper end of the instrument be lightly held
en the thumb and the fore and middle fingers of the
hand, the concavity of the curve looking towards the left
of the patient, and the general direction of the instrument
almost horizontal. The penis is to be raised with the
and, the point of the instrument inserted into the urethra
lowly carried onwards until four or five inches have dis-
red; the handle is brought to the middle line at the same
at first close to the patient's abdomen, after which it is to
ntly and lightly depressed; and as the point is felt to
se the sub-pubic curve, the handle is gradually brought
towards the operator, until it sinks beneath the hori-
l line, when the opposite extremity will be free in the
er. If difficulty occurs, the direction of the instru-
may be slightly altered, or it may be withdrawn an
or so, and then re-introduced with the handle more
ht than before, or the reverse, as the case may require.
twithstanding all, the instrument is stopped point blank,
t the same spot on each trial, there is reason to suppose
stricture is encountered. On the other hand, if the
ra is healthy, a solid sound of good size will pass almost
own weight if lightly handled; at all events, a very
pressure from the fore-finger upon its handle will be
sufficient, if additional impetus be required. The main
is to allow the point to slide easily along the *upper* sur-
f the urethra. It will not then be caught in the depression
e bulb on the floor of the urethra, nor will it be so likely

to be impeded in the sinus o
diagram representing a secti

F

Section of the urethra. *a.* Prostat

course.) It is never to be fo
action when the handle is d
bears on structures which n
force be applied. Whatever
forced: temper, patience, anc
all cases of difficulty. All a
are wholly out of place, fraug
and calculated to reflect disc

That mode of passing a cat
of the 'tour de maître,' can b
corpulent patient. It consi
with the convexity of its cur
in a perpendicular line ben
perineal fascia in this directi
point, in sweeping it round
circle, of which its point is
gradually depressing the hand
the sub-pubic curve.

When much time is requ
generally best. The head a
elevated by pillows, and the k
from each other; the operato
the couch, hold the catheter
it over the patient's left groin
tal direction; he should sup
placing the palm upwards, so
hold the penis just behind the
and thumb are then at liberty
retracting the prepuce if nece
having been introduced, it sh

ferior wall of the canal, to avoid a lacuna on the roof, imes considerably developed; an accident which gives the t pain, and sometimes disconcerts an operator. The s of the left hand gently draw the penis over the instru- as it glides easily on to the bulbous part, the handle still horizontal, or nearly so; arrived at which, if some ob- ion seems to offer, the instrument should be withdrawn ch or so, and again passed, taking care not to elevate andle so soon; after which, by gently raising it and g it to describe a curve along the middle line, the ex- y will probably glide slowly upwards into the bladder as andle sinks towards the interval between the patient's s. In passing an English gum-catheter, take care that it is urved after the stylet is removed, as the warmth of the ra tends to straighten the instrument, and so occasion it to on the floor on arriving at the membranous portion. The should be well turned up, and the curve maintained in g the first half of the catheter very close to the belly of atient, after which a rather quick depression of the carries the point easily into the bladder.

exploring the urethra, especially if the symptoms are not marked, we are not hastily to conclude, because a little ction presents itself in the passage, that stricture is of sity present. The part is extremely sensitive, and resists ut gentle efforts to traverse it, the more so if it be the time an instrument has been introduced. Sometimes neck of the bladder itself a little more than usual de- on of the handle of the catheter is required, or it may be ary to employ an instrument with a stronger and longer

size of an instrument to be first used is by no means a r of indifference. As a rule, whatever statements the t may make, we should *always* use a bougie or catheter, aller than No. 7 or 8, with a blunt, not conical or bulbous ity, as the former affords a far more certain indication situation of the obstruction than a small instrument, might pass through a slight constriction altogether; or point may be entangled in a lacuna, or in a fold of s membrane, the first of which would have been closed, e second obliterated, by the passage of an instrument ntly large to fill the urethra. By such entanglement, s, injury may be inflicted on the canal, or the unfounded

belief in the existence
induced.

Suppose, however, tl
tance from the external
its situation remembere
passed, in order to det
this enter the contracte
'*held*,' i.e. it has entere
to and retains it, so th
force is necessary for tl
ments may be necessary
small to enter the con
always bear in mind tl
careful and the more sp
since such an instrumen
proportioned to the sm

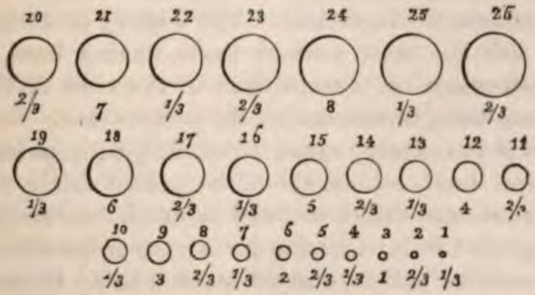
The method just rec
cient to determine the
circumstances. When
ledge of the length to
a bulbous-ended instru
be employed for the pu
them, although before
do so. For this purpo
of various sizes, from
smaller to be equal to
about No. 2 or 3. One
pass with slight pressur
be free and easily mo
passes outwards throug
is encountered. In t
urethra, generally com
half of an inch, is read
another stricture beyon
same way.

Of late years attempt
and bladder, not merely
from an instrument, but
metal tube (the 'Endos
or 12 of the catheter sca
form of a beaked sound
bladder. To the tube

piece and reflector, so as to throw a pencil of powerful rays on tever substance impinges directly on the bottom of the ght tube. Whatever this is, being comprised within a circle out the $\frac{1}{6}$ or the $\frac{1}{5}$ of an inch in diameter, is visible to the rver looking through the eyepiece and the perforated re- or. The same tube may be employed also with an ordinary f gas, or with sunlight. I have tested various Endoscopes umerous occasions during many years past, and I am com- d to say that I do not find any advantage to be derived their use in the treatment of stricture, or of any disease e bladder. It is easy to see the colour of the mucous mem- e of the urethra and of the bladder touched by the tube; to see that very small portion of a calculus against which nd of the tube rests. No illumination of the cavity of the der can be made; this being filled with urine, mostly in se more or less cloudy and opaque, less is visible there than e urethra, and in the latter spot it is difficult, indeed rarely ible, to discover the orifice of a stricture, or to identify even acteristic structures proper to the canal. Differences of ur are those only which are readily appreciable. The em- ment of such an apparatus, moreover, is not to be regarded ny means as a painless proceeding, to say the least of it; nonly it is productive of much irritation. With a large suited for examining the rectum, the result is very much e satisfactory.

itherto, in speaking of the sizes of urethral instruments, the lish scale has been always assumed, as being that best

Fig. 294.



wn in this country. The scale, however, of the French is er, as producing smaller intervals between each number, in ing these intervals more regular, and the number itself to

express the measure of the calibre mar
No. 1 is one millimetre in circumferen
metres, and so on up to 30. The Nos.
generally the Nos. 1 to 12 of our sc
numbers instead of 12. A fac-simile
seen in the figure 294.

Treatment.—Its object is twofold:

First, to restore the natural calibre
is consistent with the safety and comfor

Secondly, to maintain the adequat
afterwards.

Now, since strictures vary in amount
tability, in disposition to return, in l
liability to manifest sympathy with othe
various modes of treatment are ne
different cases. Hence innumerable inv
of the above indications have been d
treatment proposed. All, however, ma
classes. The opposing tissue of the stri
gently or forcibly; or it is wholly or pa
mical agents; or it is divided by some c
of course all these processes may be
with certain general or constitutional tr

Dilatation.—This is the mildest a
treatment to employ whenever the case
the most generally applicable, and the
large proportion of all the cases present
the method which almost all surgeons a
availing themselves of other means wh
trial is found to be inefficient. The h
that it is still the most ancient mode,
for the destruction of 'carnosities' in
never having been superseded to the pr

To apply it in ordinary cases, a flexibl
stricture will easily admit, should be p
and then be at once withdrawn with as m
as was employed in introducing it: a n
recorded, and the patient desired to com
days: the same may then be passed, pe
than before; if so, it is to be withdraw
size larger introduced, provided it requi
so. The visit is to be repeated as bef

ling, nor much smarting in micturition, follow and continue
the operation. Sometimes a fit of shivering occurs, or the
nt may be faint or sick, which are not unfrequent effects of
assage of an instrument, more especially for the first time.
ny of these phenomena take place, the interval should be
thened a day or two, and the condition of the health ex-
ed. If the patient complains of soreness of the urethra,
that micturition is painful, the urine is, perhaps, unduly
and it will be desirable to regulate his diet and habits so
promote a healthy character in the secretions generally.
ne same time, if it be so, he will generally derive benefit
a little bicarbonate or citrate of potash, combined or not,
ccasion may require, with hyoscyamus, and taken three
ur times a day; or, the alkali may be given in infusion of
u, if the mucous membrane of the bladder seems to be
ble, or disposed to secrete too freely. Irritability of the
ra, however, is much allayed by the gentle and careful use
struments. Even when much suffering is produced at the
attempt, it usually becomes notably less at every succeed-
assage of the sound. Supposing none of these consequences
ppen, the same plan of gradual advance may be continued
ch visit, so that No. 11 or 12 may be soon safely reached
ch a case as that described, when a very fair amount of
ation has been achieved: if the urethra is of the ordinary
if the last step or two in the progress have been easily
, without pain or annoyance to the patient, it is well to go
No. 12 or 13. Finally, the maximum point of dilatation
ed at should be maintained for a short time, the largest-
instrument employed being used at gradually increasing
vals of time, in order to maintain the ground which has
won.

however, the case is more difficult, and after the use of a
ler instrument no penetration is effected, it is desirable to
he patient make water; if the stream is small, the size of
nstrument should correspond with it; if it is not, the con-
ion cannot be very considerable, and some fold of mem-
e, or perhaps a false passage, has entangled the point; and
ny case the bougie to be tried next should be as nearly as
ible of the size of the stream. In introducing it, the floor
he urethra, as well as any lateral deviation in its course,
to be avoided, these being favourite situations for false
ages. Failing of success in one direction, we should next

cautiously carry the point tow a short time to insinuate it e side of the passage, if the sligh indicates that the orifice exists when the instrument has thus b endeavour to facilitate its pro moderate pressure, the precise portioned to the degree which t complaining. Some minutes s the success of which will mu and singleness of purpose with the introduction of the left for rectum, will facilitate the prog permitting its point to be raise us to judge more precisely of the parts around; above all, passage.

The employment of continue mencement of an indurated an sometimes successful, either mechanical action upon the yi tion. The operator, however, s acting on the contraction, and passage. It is important to re relation to these attempts, that grasped, the operator may infe strictured part, and that whe and capable of being withdraw certainly not in the stricture; i in a false passage. If, after bei suddenly for a short distanc movable, it is probable that a f the urethral walls perforated; rence all further efforts must days, and the employment of i to, must be conducted with vigil of the lacerated part.

If after several applications o still not passed, or if the case be more than usually difficult, cautions to insure success. It when in bed, with the skin war

. A hot hip-bath just before the visit is sometimes ad-
ageous. When introducing the instrument, all unnecessary
sure should be carefully guarded against. Premising that
situation of the stricture has been carefully verified before-
l, a silver catheter should be selected, the size of which
ld be a little less than that of the stream of urine. Perhaps
sometimes desirable to apply the oil *to the urethra itself*,
er than to the instrument, injecting, by means of a common
s syringe, four or five drachms of olive-oil. This proceed-
facilitates the progress of a small instrument to the stricture,
tends to open the latter by the penetration of the oil into
narrowed passage itself.

hen the stricture has been passed, considerable care is
ssary in guiding onwards the point through the canal
nd, to prevent its becoming engaged in the enlarged
næ which are commonly found here. These are usually on
floor; and not a little patience and management are some-
s required to carry the point of a slender instrument over
n and lodge it safely in the bladder. Usually the point has
e tilted upwards somewhat; and here it is that the finger
he rectum is most commonly of use.

alse passages are some of the most perplexing complications
narrow stricture which the operator has to deal with,
much as the difficulty of getting into the right opening is
tly increased by the readiness with which the instrument
rs the wrong one. It is to be remembered that, as a rule,
e passages most frequently commence on a level *below* that
he proper opening; and that the operator's finger when in
rectum, near to which the false passage is almost certain
run, will inform him as to the route which the catheter is
ing, whether it be too close to the gut or deviating to the
ht or left of the median line, and will also assist him to
ect the point in its true course.

he influence of chloroform has been sometimes found ex-
mely useful in facilitating the passage of a catheter or sound
ough the urethra, especially when it is more than ordinarily
sitive, and the pain occasioned by instrumental interference
duces uncontrollable and involuntary efforts of resistance on
part of the patient. It is to be remembered that it is not
the purpose of permitting the instrument to be used with
ater force than before, but in order to produce relaxation of
muscular tissues, both of the voluntary and involuntary

kinds, that the chlorofor
course, be given to a suffic

Continuous or permanent
rapidly dilating a strictu
ordinary treatment is th
urethra for forty-eight or
removing it. Especially
countered in its introduc
great value; if, owing to
of an instrument is follow
sometimes one of the m
adopted. In putting it i
finement to the house m
having been introduced, i
the body; for this purpos
hips, another is connect
crest of the ilium and pas
to the crest, and then mad
by a piece of narrow tape
tuber ischii. A peg of
catheter, or, better still, a
with the other end in a
catheter, it may be attac
circling the penis.

In the management of
attended to: first, the cat
into the bladder, or at an
distance is readily ascerta
through it, and drawing
stream just ceases; a ver
can then remain within
passed has been a silver o
be of gum-elastic, as caus
while the process of dila
metal catheters are emplo
instrument be permitted
tightly in the stricture;
always using a catheter wl
which is large enough to b
while in the latter case ir
may produce unpleasant c
remaining in bed, the p

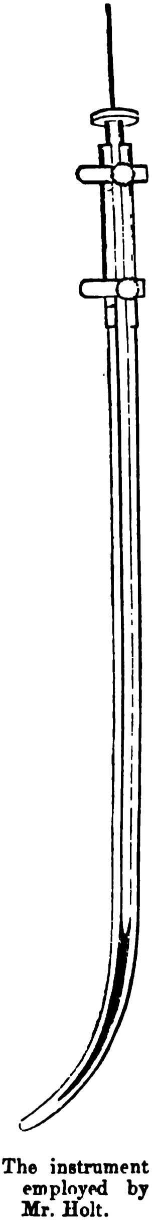
cyamus or opium, if pain or irritation render it necessary. latter may be given in the form of suppository; but this rely necessary if proper care is taken in the management of atheter, which is the most important part of the treatment. owever, blood appears in the urine, or fever, or swollen le, the catheter must be withdrawn at once.

ually, in about thirty-six hours, a purulent discharge is around the instrument, which soon becomes loose in the , although when first introduced it may have been firmly ed by the stricture. It may then be replaced by another zes larger, which will probably enter easily. In a day or similar advance may be made; and if all go well, the ess may be continued for five or six days; the patient up daily for a few hours, if the gum-catheter is employed. is fatigued, a day or two's rest may be given, and the esumed if necessary. When a full size has been reached, theter is to be withdrawn, and an instrument passed for a few days, gradually increasing the interval, but vouring to retain as much as possible of the calibre l; a certain degree of recontraction at first, however, is s met with.

hanical apparatus for effecting dilatation.—Among various of special apparatus may be noticed a method adopted by Thomas Wakley, which consists in sliding tubes over a urethral guide first passed into the bladder; so that if the is at first correctly taken, all the other tubes will follow ame course. Different methods of using sliding tubes were rly adopted by Dr. Buchanan of Glasgow (1831), Dr. Hut- of Dublin (1835); by Desault (1797), and Maisonneuve). The attempt has been frequently made to dilate a ure by means of a single instrument which expands in situ, e place of several instruments of increasing calibres which re to be successively pushed through the constricted part. this object Mr. Luxmoor (1812) employed diverging l rods; Leroy d'Etiolles the same method, some years ; and M. Perrève a somewhat similar plan (1847): Dr. tt commenced the employment of fluid expansion (1819). lesser degree, the accomplishment of the same object has attempted by the use of catgut bougies, and very recently ougies of Laminaria, a species of seaweed which expands ontact with moisture. A German surgeon formerly, and bard of Lyons more recently, have employed metallic

expanding instruments for the
latter chiefly employed such inst

Fig. 295.



The instrument employed by Mr. Holt.

the incisions after
posed this method
by progressive step
it to a higher degre
instrument the ext
is limited by the
which is well know
the urethra. More
the method of forcil
strument precisely s
has operated man
greater freedom fr
would generally hav
tures the stricture

In considering
means which have b
to forbear remarkin
not rupture, compl
efficient or so desir
simple bougie, whe
with a light hand.
affair of overcoming
pedients of the engi
themselves; but we
prosecution of dila
avoid producing le
urethra and its im
treated as tissues en
relations of the high

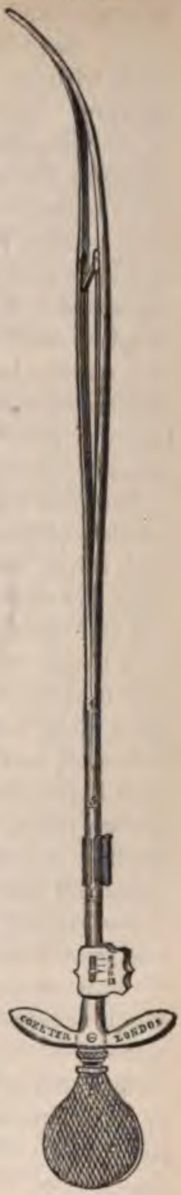
On the other ha
which I have now
an old and obstinat
to a certain modera
slightest advance so
stitutional sympton
ruptured at once up
urethra without any
this as the result of
from the use of an i
which distends the

the catheter-scale. If, however, forcible
tion be applied to an old and rigid stric-
after the method in vogue thirty or forty
ago (Mayor), that is by driving a large
al metal bougie through the obstruction,
e symptoms are almost infallibly incurred.
so employed, and not exerted from within
rds as in the distending instruments re-
to, pushes the stricture down the canal,
s its cellular connections, and infallibly
ces inflammation and fever.

Holt describes his mode of operating as
s: The instrument 'consists of two
ed blades fixed in a divided handle, and
ning between them a wire welded to their
, and on this wire a tube (which when in-
ed between the blades corresponds to the
al calibre of the urethra) is quickly passed,
hus ruptures or splits the obstruction.'
g introduced it, and 'reached the bladder,
ilator should be gently rotated, to prove
it is fairly within that viscus; and being
assured, the surgeon is next to place the
of the tube he had previously selected
the wire between the blades, and thrust it
ly onwards to the end. The stricture
now fairly split, the dilator should be
ed, to still further separate the sides of the
and then be withdrawn; a catheter corre-
ding to the number of the tube being sub-
ted for the purpose of removing the urine.'*
catheter is then removed, the patient
ted with quinine and opium for the first
ty-four hours; and the same catheter in-
uced in forty-eight hours; and again on
nate days for a week or two, gradually
thening the interval.

e are under obligations to Mr. Holt for
everingly pursuing his practice by rupture,

Fig. 296.



Distending instrument; the blades are opened to the full extent. The index is seen just below the handle.

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he immediate Treatment of Stricture. B. Holt. Lon-
861, p. 7.

by which the remarkable facts
demonstrated. I do not hesit
which have hitherto resiste
dealt with by that method, wh
my own. The cases in which
to be valuable are those in
stituting the stricture does no
to be entirely ruptured. Whe
hard nodule, it is, in my opini
divide it with a cutting instru
cases which have been hithert
question offer advantages. T
first sight a harsh and rough
prejudiced examination of its
personal practice of it, has co
character accorded to it here.

The plan which I have adop
consists of two long and narro
each other, but both forming
ment the size of No. 3, 4, or 5
end and throughout four inche
by a handle containing a scre
rods to diverge from each othe
given spot, forming a spindle-
in length, and the third or hal
is an index near the handle wh
tension made, by pointing out
which is reached, as the opera
reason for carrying distension
of the urethra will admit, is th
the great majority of stricture
the bulbous portion of the ure
which naturally possesses a ca
catheter-scale, and that ordina
inefficiently acts upon them. T
by this instrument differs m
being made very slowly (bette
chloroform), so that from seve
slowly reaching the maximum
being to overstretch the morbi
them as little, as possible, in c
to greatly impair, the natural

ct. Before operating, the distance of the stricture from the ternal meatus is measured by passing a full-sized bougie down the stricture; the slide is then placed upon the figure on the m which denotes that distance. The instrument is passed til the slide arrives at the meatus, and the blades are slowly arated: when the maximum distension is reached, the screw turned back only about half-way, so as not to close the blades; instrument is withdrawn; a full-sized gum catheter is at e passed, and allowed to remain twenty-four hours. On the rd day after the operation a large metallic sound is passed, l subsequently at longer intervals. The instrument may also used rapidly to produce rupture if preferred.

To return to the subject of gradual dilatation, and particularly its employment for old and irritable strictures: in such es, especially when occurring in enfeebled constitutions, it is essary to proceed with great caution. More progress will be en made by employing those adjuvants, which a deranged te of the constitution requires, than by pertinaciously con- uing the use of the bougie when the stricture is unusually stinate; this is a maxim of the first importance. Further, ving arrived at any given number in the scale, say 6 or 7, yond which it is difficult to proceed, we may sometimes gain ound by employing half or intermediate sizes, which I have en in the habit of thus using for many years. Or we may ploy the French scale, which gives 18 numbers between our mbers 1 and 12, and so admits of more gradual steps in the eatment; the number 3 of the French scale equalling our umber 1, and the 20 our number 12; these have the advantage indicating the exact calibre of the urethra through which ey have passed, the number of each indicating so many milli- etres of circumference.

There are some cases unquestionably in which—however much f pains and care, of adjuvants local and general, have been expended—the patient's existence is barely a tolerable one. The rethra and bladder are so sensitive, or the stricture is so con- ractile, that exquisite suffering from instrumental interference, nd fever, or retention of urine constant or constantly impend- ng, are the alternations presented. These facts, recognised by ll surgeons of experience, have led to proposals to treat the alady by many other methods. The next to be considered is he treatment by caustic agents.

1. *Caustics.*—During three centuries at least, escharotic sub-

stances have been employed l
stroying the obstructions, in e
or 'caruncle,' which oppose t
view, savin, antimony, merc
alum, and other active agent
trivance or another down to t
latter part of last century,
silver; and Mr. Whately, in
century, the caustic potash.
posed by their advocates to a
and thus allaying spasm; se
so destroying, the morbid t
lastly, by dissolving or softeni
instruments to be passed. A
been obtained by some Engli
result of which is, that the p
has been for some considerab
hands of the best surgeons.
if it be possible to limit the a
possessing the active qualiti
those of the potassa fusa, to
particularly in those cases
passages, and which furnish
which the surgeon is called u
no means free from painful a
violent spasm, retention, and
to believe that these caustics
similar to that which follows
the human body, and liable t
tion, and the formation of fr
hand, the advocates of potas
its use the catheter is more e
which they have been unable
agent has frequently been su
this kind may, they say, be r
granted as probable that a
gained by the method in que
may in some hands be undou
however, already alluded to,
should the very important co
and gentle management, th
which a catheter of some l

through the stricture into the bladder; a result far more desirable than any which is only accomplished by means of caustic applications. The conviction gains ground, both here and abroad, that those cases which have been called 'impermeable,' in relation to catheterism, should very rarely be considered so. Perhaps the opinions and practice of the profession abroad, in reference to caustics, cannot be more truly or concisely represented than in the recent words of Nélaton, who states that 'cauterisation of any kind is rarely employed now, on account of its uncertainty and the tumefaction of the urethra and retention of urine which it produces, and the new formation of contractile tissue which is likely to result.'* In like manner, the widely received opinion in England is thus expressed by Mr. Erichsen: 'This practice, stigmatised by Mr. Liston as "most atrocious," has now but few advocates; and, indeed, there appears to be nothing that it effects but what can be accomplished much more safely and easily by a catheter or sound in an ordinarily skilful hand.'† It may be added, that my own observation and experience lead me fully to coincide with these able surgeons.

Under such circumstances, little need be said here as to the method of employing these agents. It suffices to state that the nitrate of silver may be applied by passing a small stilet, on which the salt has been fused, by means of a hollow canula down to the stricture, with which the agent is permitted to remain in contact for a few seconds. The potassa fusa is ordinarily employed by carefully attaching a small fragment, such as the fourth or the half of a grain, to the end of a wax bougie, and then passing it down and pressing it for a moment or two against that structure, whatever it may chance to be, which stops the instrument in its progress along the urethra.‡

2. *Incisions.*—Under this somewhat comprehensive term are included numerous modes of dividing the morbid structure which surrounds and narrows the urethra. All may be arranged in two classes: the first contains operations in which the incision is made altogether within the urethra; the second, those in which incisions commence from without, usually in the peri-

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* *Élémens de Path. chir.* Paris, 1858, tom. v. p. 409.

† *Science and Art of Surgery*, 2nd edit. Lond. 1857, p. 925.

‡ Further information on this subject, if required, may be found in the works of B. Phillips, who first advocated and subsequently repudiated the employment of caustic; of Dr. Jas. Arnott, Mr. Wade, and Mr. H. Smith.

neum, and are carried into the urethra a
stricture.

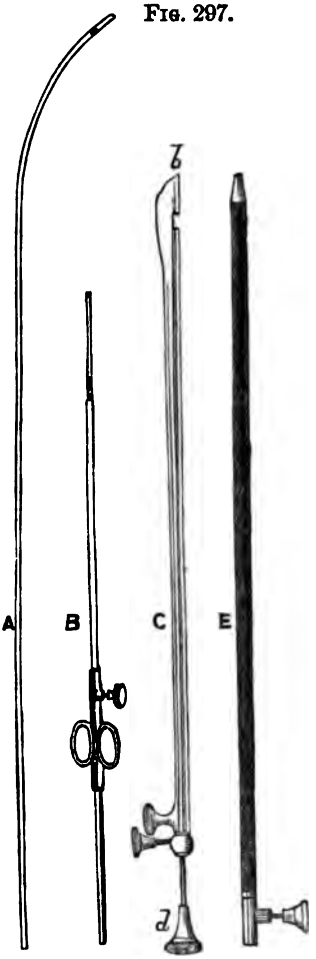
The first, or internal urethrotomy, wi
This method of dealing with obstinate st
tised for above a century. Long before
cisions had been combined with the use o
it does not appear that they were employ
the period named. Allies of France (17
delphia (1795), John Bell (1806), Charle
(1823), and Stafford (1827), have employe
and different modes of performing intern
forms of some of these have been occ
modern surgeons in this country; but
practised much more extensively in Fra
rous forms of urethrotome have been desi

All belong to one of two classes: in th
by pushing downwards a lancet-like bl
slender conductor in advance of it, into
divided—incision from before backwards.
tion of the instrument containing a sm
first carried through the stricture, which is
the blade and drawing it outwards throug
tracted portion—incision from behind for

Incision from before backwards.—Whene
tised, a guide should previously be passed
into the bladder, to insure an accurate
formerly incisions were made without any
wholly discountenanced, on account of
danger. This proceeding has usually b
applicable to obstinate strictures which ar
or four inches of the external meatus, p
greatly indurated, than to those which ar
although it is quite possible, especially wit
to employ it for these also. It has not bee
country, but has of late come more into v
recent employment of a fine flexible guid
urethrotome in its passage through the
pushed onwards into the bladder. The p
method cannot be endorsed here: a bette
guide, has been employed by Mr. Wood o
pital; and more lately a 'catheter urethr
signed by the present writer, 'the peculia

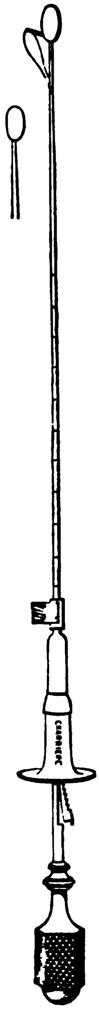
ry step of the process is mechanically certain and safe, after Io. 2 silver catheter has been passed.' The catheter having hdrawn the urine, and thus proved that the instrument is

Fig. 297.



silver catheter, size of No. 2, by which the rine is withdrawn. B is a rod of the same ze, which screws into the end of the catheter. is the urethrotome: *b* the blade sheathed; the handle which unsheathes it. This instruent passes down a groove in A, and, after insing the stricture, is withdrawn; when E, a m-elastic catheter, is passed into the bladder er the catheter and rod, AB.

Fig. 298.

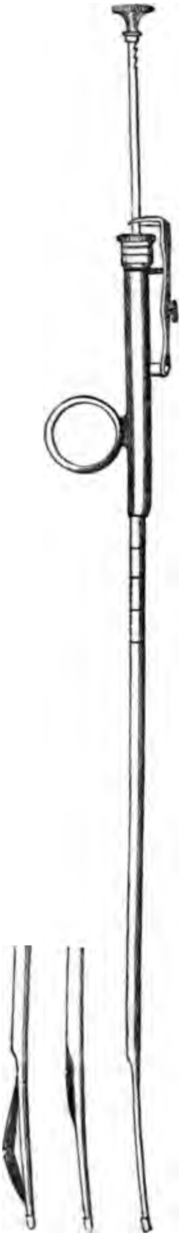


Civiale's urethrotome.

in a false passage, the blade slides along it through the icture, is then withdrawn, and a large gum catheter is passed

over the small silver catheter
cludes the op
for twenty-
treatment is
next section
been devised
Paris, more
kind which
be used not
after such
it can be ma
augmented
Incision f
this mode
more certai
and it is ap
canal. It r
stricture sh
hand to ad
which conta
beyond, bef
this portion
4, or 5. T
plished by
often been
or 5 throug
sion to em
But such a
quaintance
a cutting o
of very smal
that is, that
increased b
application
fever and di
counterbala
they may e
outset of tr
bougie, yet
dilated, and
easily coun
instrument

FIG. 299.



Trélat's urethrotome.

which habitually admits No. 6 or 7 may be the cause of the greatest suffering, of almost daily retention, and be irritated instead of benefited by all attempts to dilate. It is in such cases, happily not frequent, that incision has proved of very great service. I have rarely experienced better results from any operation than those obtained from internal urethrotomy in cases of the kind described.

Before employing any form of internal urethrotomy, it is necessary to have an accurate idea of the site and extent of the stricture to be divided; this is obtained by employing on two or three occasions a solid sound with a bulbous extremity, just large enough to pass through the contracted part (p. 954).

I have employed by choice the urethrotome of Civiale,* and to the present day (1870) I prefer it to any other. In this instrument the blade lies concealed in the bulbous extremity, from which, by means of a simple contrivance in the upper end of the sheath or canula, it can be made to project one, two, three, or four degrees, according to the depth of the incision intended (see Fig. 298). The mode of proceeding is as follows: having sufficiently dilated the stricture, so that it will admit about a No. 4 or 5 bougie, the situation and extent of the obstruction are ascertained by means of the urethrotome itself, the bulbous end of which forms a useful sound. The bulb is then carried about one-third of an inch, or a little more, beyond the stricture, the blade projected, and the incision made by drawing it slowly but firmly outwards—that is, in a direction towards the external meatus—to the distance of an inch and a half or two inches, generally towards the floor of the urethra, so as to incise fully the stricture and a little of the sound urethra before and behind it. Experience shows that hazard is not increased by the length of the incision, which should always be fully adequate to the purpose; but it is quite otherwise in the important particular of depth: this should never exceed the amount produced by about half the power of projection possessed by the instrument in question. It is not an unwise proceeding to pass immediately after the incision the dilating or distending instrument to the fullest size, so as to ensure the perfect freedom of the canal at all points. After the operation, a full-sized elastic catheter is

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* Various other methods and instruments have been devised, by Amussat, Leroy d'Etiolles, Sédillot, Maisonneuve, Ricord, Mercier, Reybard, Heurteloup, Bonnet, Boinet, and others; but it is deemed unnecessary to refer further to them here.

retained for twenty-four hours. During the first fort
metallic sound is passed about every second day, taking
press the convexity of the curve well downwards into th
the wound, so as to keep the lips asunder, or at all e
extend the cicatrix. After this it is to be used eve
days, every four, every week, and at last twice a
Hæmorrhage to any considerable extent is rare; if it i
full-sized instrument in the urethra, and external cold,
it. Febrile symptoms occasionally show themselves a
operation, as in other modes of treatment, and disappe
out remedial means. In relation to the accidents wh
immediately follow the operation, the following is the
perhaps a hundred cases of urethrotomy performed by m
the manner described. In those practised for stricture
in the urethra in front of the scrotum, I have seen no il
whatever. In those practised in the bulbous part of the
I have twice seen free but never dangerous hæmorrha
sometimes a smart attack of fever, but never abscess, ex
tion of urine, inflammation of the bladder or kidneys, or
Such occurrences may occasionally be met with, do
because any instrumental interference with the urethr
the passing of a bougie—is apt in certain cases, happ
few in number, to give rise to these conditions. Indeed,
who is experienced in the surgery of the urinary org
question that such events must sometimes arise.

In relation to the positive benefits which are to be o
the immediate result is perfect. Properly incised, the
longer the slightest grasp on the largest instrument int
and it is often difficult to recognise the seat of the for
traction.

In some cases these results are permanent; in oth
stricture shows a tendency to return; but as in external
so in internal, the contractility and the nondilatability
characters which have been before shown to be the ind
for resort to operative procedure—are generally great
nished in intensity; and if subsequent treatment be ne
dilatation usually suffices.

Such have been the general results of urethrotomy, wh
perly performed, and applied to suitable cases. I think
however, to add here, that my observation and exper
distension at a single sitting, or by rupture, have convi
that we may thus produce excellent results at first, whi

ever are often not durable; so that these methods will by no means supersede internal incisions. For all non-dilatable strictures situated from two to four inches from the external meatus, I decidedly prefer internal urethrotomy: the operation is perfectly safe and easy to perform, and its results more lasting and complete than any other.

Incision is also especially applicable to that not uncommon form of stricture which occurs at, or very near to, the orifice of the urethra. It may be congenital, the result of inflammation, of cicatrisation after chancre, or other lesion there. It may be the only obstruction in the canal, and yet give rise to the most painful and serious symptoms, and even to a fatal result. I have repeatedly given complete relief to distressing symptoms, the cause of which was not suspected, by dividing an external meatus, which admitted nevertheless a No. 5 or 6 catheter. The incision may be performed with a director, and a straight, narrow-bladed bistoury; but the most efficient instrument is a small *bistouri caché*, which is passed through the contracted part of the canal; pressure being made on the handle, the blade is opened to an extent previously determined and arranged by means of the screw; it is then drawn out, with the edge turned towards the frænum, and the section is made. A piece of dry lint, introduced by the meatus for an inch and left there, stops the bleeding. After a day or two, the patient introduces for himself a short conical metal bougie, about three inches long, and provided with a handle sufficiently large to prevent its slipping into the urethra.

The late Mr. Colles, of Dublin, adopted a method of treating some of these cases which deserves notice. It consists in drawing over the surfaces divided by the section described the two edges of urethral mucous membrane, and stitching them to the external margins of the wound, each lip of which is thus covered by membrane, and prevented from adhering to its fellow.

External urethrotomy.—The division of the tissue composing the stricture is sometimes effected by incisions commenced from the external surface. Various external operations, although designed mainly to relieve retention of urine, were made at a very early period, according to Rhazes (10th century), and Avicenna (11th century). The earliest operation for the cure of stricture apart from retention, but in which the surgeon could pass no catheter, is recorded by Wiseman (1652). A few years afterwards, Solingen, at Livourne, adopted a similar course.

point of the knife in the groove of the staff about an i the shoulder, and cuts upwards, dividing the tissu upper end of the groove. If the stricture has been divided, the shoulder of the staff may be passed d through the incised part with ease, and if so, is wi and a catheter passed in its place. Since, however, of a catheter sometimes catches in the wound, and do readily into the bladder, perhaps from the urethra occ collapsing at the posterior limit of the incision, I pre troduce by the wound, before withdrawing the staff, a curved director along the convexity of the staff, on wh catheter glides securely and certainly into the bladder. catheter, however (which should not be smaller than be obstructed at any point, and be obviously grasped has been passed, it is certain that some fibres still requ sion, and these should be at once incised.

At the end of forty-eight hours the catheter is to drawn; and generally about three days after a full-size should be passed. Mr. Syme likes to guard the wou contact with urine as much as possible, by introducin from the wound to the bladder, and leaving it there, lithotomy; and he employs, in that situation, one with curve, and about nine inches long, instead of the cathete he dispenses with altogether at first. Subsequently the is passed every three or four days for a time, then once then once a fortnight, and finally once a month; and t tice may be continued if any disposition to contract but if otherwise, it is necessary only to make a trial of time to time.

Mr. Syme lays stress upon the importance of atte the following particulars, which I add briefly here: 1. the median line in the incisions. 2. Make a direct down to the staff, not a tortuous one. 3. Divide the the contracted part, rather more than less. 4. Do n far back as to endanger the deep fascia of the perin use the knife in the deep incisions with the cutting ed most. 5. Do not close the end of the inlying cat urine be forced into or through the wound, for want o in the instrument. 6. Avoid escape or displacement strument. 7. If incisions are made far back, introduc tube through the wound when the catheter is w 8. Do not neglect dilatation during the progress of re

lts of treatment by external incisions.—In reference to the
ion without a guide, or the perineal section, the best that
said of it is, that it is a hazardous proceeding, and no
n should entertain the idea of performing it except after
ghly assuring himself that the stricture cannot be rendered
able to instruments, and so made amenable to other
of treatment. In a few cases the operation is performed
sfully, but in most there can be little doubt that the
of the stricture itself is not followed, and that the knife
a new channel through adjacent and often very unsound
s, very inadequate to perform subsequently the function of
hra. In many instances the attempt to make a channel
bladder has wholly failed, and the patient has been re-
l from the operating-table unrelieved; and in not a few
sult of the proceeding has been fatal. This termination,
er, is to be anticipated in a large proportion of what must
arily be the worst cases of their kind. Such views of
peration tend to impress us more strongly with the con-
n, that every chance of getting an instrument through
ilated urethra by protracted but gentle endeavours,
ned with rest and constitutional treatment, should be
sted, before we consent to resort to perineal section.

pecting the operation of external division, or that per-
d on a grooved staff, it will be remembered that it is
able only to cases which present an insuperable tendency
ntract after dilatation, in which the existence of in-
ble perineal fistulæ demands some such operation.

er a careful observation of a large number of cases so
d, there is ground for speaking with some degree of
nty respecting the immediate and remote results of this
ion. Among 219 cases, collected with scrupulous care by
f, there was a mortality of between six and seven per cent.
is percentage nearly two-thirds died of pyæmia, the
nder (one or two only excepted) from fever and sup-
on of urine. Such a mortality is by no means large
we consider what kind of subjects selected bad cases of
re are, especially as they occur in hospital practice, by
most of this series was furnished.

morrhage, to a moderate but not dangerous extent, not
uently occurs either at or after the operation. Very
is it serious; and when it is, there ought not to be
lty in stopping it. A full-sized catheter being in the

urethra, it is necessary to plug the wound with
maintain a firm pad of the same material over it, by m
T-bandage closely applied. In one case in which I
the perineum being greatly indurated with several
there was obstinate bleeding from vessels which the
would not hold, owing to the nature of the tissue i
their mouths were embedded; but I succeeded in sto
by carrying a small curved needle beneath each bleedin
In regard to the important question of remote results f
operation, there have been some few cases undoubtedly i
it has failed to be successful; in a much larger proporti
or less of recontraction appears after the lapse of time
has sometimes arisen from want of care to divide th
contracted portion of the urethra; in other cases, from
of subsequent dilatation. On the other hand, in some
can personally vouch for the fact that no narrowing
peared seven years after the operation. In most, I be
will be always necessary, or at all events prudent, to m
some dilatation afterwards; the condition usually
being a dilatable urethra, in the place of a non-dilata
obstinate stricture.

Spasm of the Urethra.

It is extremely rare that any considerable narro
the urethra takes place as the result of pure spasm
muscles surrounding the passage. Granted, however,
sence of organic narrowing, or of inflammation in the
an undue action of the urethral muscles may be
so as still further to narrow it. There is no doubt
slight degree of this action may be excited in any part
passage; but it certainly becomes more obvious in the
branous part, where sphincteric muscles exist in addi
those unstriped fibres which surround the canal through
whole of its course. Nevertheless the existence of 'sp
very constantly and very frequently affirmed, often with
proof of its presence, and usually in order to acc
unsuccessful catheterism. Organic difficulties are qu
ficient without it, in many bad cases, to baffle at ti
most experienced and most dexterous operator.

As immediate causes of spasm may be named the fo
the presence of organic stricture; of inflammation from
gonorrhœal discharge; irritation of the mucous m

n highly acid, and occasionally from acrid, urine; from eign matters ingested, and expelled by the urine, as can- rides, turpentine, and perhaps some forms of condiments l of alcoholic drinks; and from voluntary retention of urine rted during too long a period of time. Examples of more note causes of spasm are rectal irritations, as hæmorrhoids, ure, prolapsus, fistulæ, operations in the rectum, ascarides, rigo about the anus, derangements of the digestive apparatus l of the cerebro-spinal system. But it is important to re- mber that the distinguishing feature which marks the nomena thus ascribed to irregular muscular contraction, by which they are contrasted with those of organic cture, is their transitory character. The symptoms of a rowed urethra may repeatedly occur, but the canal ordinarily sesses its natural degree of patency. This is never the case the presence of organic stricture; the stream then varies, it never attains the natural size.

n treating spasm, general principles must be kept in view, applied according to the particular requirements of each e. Local treatment of the urethra itself is often of secondary ortance, sometimes, indeed, prejudicial. The main thing, in all spasmodic affections, is not to regard so much the or symptom itself as to investigate the cause, a correct reciation of which is the only key to successful treatment. s must be carefully sought, not only in the urinary tract, in adjacent and allied organs, and in the condition of the em at large. Speaking in general terms, it will be found attention directed to the condition of the animal powers, the improvement of the secretions, and to the regulation of regimen and habits of the patient, will conduce more to the oval of the local symptoms than any measures apparently more direct or special application.

any degree of organic stricture coexists, it is essential to t this in the usual way; but as far as the complication of sm is concerned, the treatment consists in obviating all rces of derangement which can be discovered as likely to uence the condition of the local disease.

have known a single instance of spasmodic retention to ur periodically, and to disappear before the use of quinine: B. Brodie records one similar case. A very hot hip-bath, cupping on the perineum, or the inhalation of chloroform y sometimes give instant relief. For the most part, however,

spasmodic action in the urethr
affecting a part or the whole
inducing retention of urine.
will therefore be referred to t
(See Retention of Urine, p. 98

Inflammation.—Retention o
inflammation of the urethra; b
stricture in any sense in wh
ployed; the pathological co
cases is acute inflammation
that gland (see p. 940). The
and tenderness in the perine
exquisitely painful; the strea
of passing it, and ceases befo
desire diminishes. Usually it
purulent discharge from the u
by external cold or wet; the
usually present. As this co
under the surgeon's notice fo
subject of treatment will be
to that condition resulting fro

Tumours in the urethra.—
was formerly supposed, in nea
of 'carnosities' or 'caruncles'
brane of the urethra. Such
excessively rare.

Pascal (1718) describes two cases
obstructing the urethra. Morgagni (
one which he had seen among man
three instances. Hunter met with t
Royal College of Surgeons. Sir Cha
Amussat, Civiale, Lallemand, Ricord,
occasional cases met with in their o
others in this country have met with
exists in the Museum of Guy's Hospit
mucous membrane of the membranous
example of small polypus springing f
fifty-four years, a patient in the St.
its existence, which could be ascertain
of micturition. Those which are foun
which appear almost confined, as regar
usually soft, of a rose-red colour, bleed
Their close proximity to the erectile ti
to be the cause of their peculiar vascu
to be found in the posterior parts of th

rations referred to. On the other hand, almost all the specimens of the polypoid growths which I have seen are confined to the prostatic portion, and are sometimes accompanied by others at the neck of the bladder or within it, to which latter, indeed, they then have the appearance of being secondary formations, and they are more frequently found affecting only the lining of the bladder, and not that of the urethra at all. In such cases their structure amounts to little more than hypertrophy of the mucous membrane.

The conclusions to be drawn from the facts known respecting growths into the urethral canal are:

First, that the existence of any excrescence so large as to attract observation as an independent growth in the urethra is extremely rare.

Secondly, that these bodies consist either of (*a*) *vascular granulations;* (*b*) *polypoid formations* peculiar to the prostatic part of the urethra; or (*c*) masses of *tubercular* and *cancerous* origin.

Lastly, that tubercular and cancerous deposits are rarely primary in the urethra, but are mostly secondary to disease of the kidney, bladder, or prostate, and rarely appear until the primary disease has been developed to a formidable extent elsewhere.

Urinary abscess—most frequently a result of obstruction in the urethral canal—may be regarded in reference to its situation as penal or ante-scrotal, scrotal, perineal, and intra-pelvic. Among these the perineal is the most common, next comes the scrotal; the intra-pelvic occurs usually in very advanced cases of stricture, &c., in which a fatal result is impending, and also as a consequence of operations; and the penal is rare, most frequently being caused by gonorrhœal inflammation of the urethra.

Occasionally, but by no means commonly, urinary abscess in the perineum may be met with, when there is no obstruction in any part of the urethra. When this is the case, there is some ground for suspecting that disease exists at or near the neck of the bladder, particularly disease of the prostate. In chronic suppurative disease of that organ, perineal abscess sometimes appears.

Ordinary urinary abscess in the perineum may be acute or chronic: the former usually requires prompt interference on the part of the surgeon, and its presence is often indicated by constitutional symptoms before local evidence appears of a marked character. If these are severe, and there are also tension, fulness, and tenderness in the perineum, a free and deep

The importance of speedily evacua
matter, even at the commencement of
be overrated. Matter pent up behind
which forms a partition too dense to be
of absorption, will find its way into th
pelvis, by the side of the bladder, betw
and give rise to dangerous consequences
to urethro-rectal or vesico-rectal fistulæ.
into the urethra, and be discharged b
The collection having been opened,
escapes, usually alone, sometimes mix
necessarily so. One of the main obje
opening into a collection of matter in
vent the occurrence of any lesion of th
evacuation be soon and fully insured, w
cavity gradually closing, and that no
when there will be less fear of its remai
becoming an abnormal passage for the

In the case of chronic abscess, it is d
should be made when the presence
evident. These abscesses are usually
bourhood of the bulbous portion of the
the perineum and scrotum; sometimes
ulceration behind the stricture, and esc
urine into the cellular tissue; often

through it, which must occur at each act of micturition if the stricture be narrow, prevents its closure. This artificial canal, usually termed urinary fistula, is one of the common accompaniments of neglected stricture, and often forms a troublesome complication.

Urinary fistulæ.—The external openings of these passages are most commonly seen in the perineum and scrotum, which are traversed by them in various, and often circuitous, routes; less frequently they are observed in the groins, the upper part of the thighs, the adjacent part of the nates, or even above the pubic symphysis. In the last-named situation, the devious channel usually results from incisions made to relieve extravasation; but in the scrotum or perineum it is generally due to a previously-existing urinary abscess.

Under the term 'urinary fistulæ' all these conditions are commonly included; some of them simple, and easily amenable to treatment; others complicated, and requiring much care and time in order to attain a successful result. Some are merely narrow channels through nearly healthy parts; others pass through structures indurated and deformed by repeated deposits of plastic matter, and sometimes connected with cavities secreting pus, and detaining in their interior some quantity of the urinary secretion. The external orifices of the fistulous passage may be few or numerous; being in the latter case the outlets of sinuous channels springing from the original track, and giving exit to a number of small streams when the act of micturition is performed. And lastly, besides the foregoing, there are those openings into the urethra which have their origin in loss of substance by sloughing from extravasation, phagedænic ulceration, or violent injury to the parts; and these abnormal conditions are distinct in their nature from the two preceding classes. This mode of arranging the numerous and widely-differing lesions comprehended under the general term urinary fistulæ, indicates three forms of morbid condition, each requiring appropriate treatment.

1. Simple fistulæ. The first class embraces those cases where, in connection with stricture of the urethra, one or more fistulous passages exist, the surrounding parts being not much altered from their natural or healthy condition. These openings are the result of nature's mode of affording relief in cases of narrow stricture; they act as safety-valves to the pressure exerted upon important organs behind the obstruction. Thus

we often see patients enjoying fair health and comfor standing large fistulous passages in the perineum, b their urine is passed. But the annoyance, sometim besides the tendency to grow worse, which accomp fistula, to say nothing of considerations arising in the sexual function, demand the interference of the bring about a natural state of things.

For these cases, as a rule, nothing else is requi dilate fully the urethra. The urine will flow by channel, and the fistulæ will heal of themselves, if free passage from the bladder. Those patients w exceptional instances to this rule are for the most constitution, have little reparative power, or are some chronic disease in addition to stricture of The management of these is mostly that of the nex

2. Cases in which the fistulæ pass through tissu and deformed by inflammatory exudation.

In these cases also, the primary object is to dilat the stricture, and to observe the effect induced. them it is sufficient to enable the fistulous passa slowly. Dilatation, however, having been maintai time, and little or no benefit having resulted, it sirable either to stimulate the walls of the fistulæ and so bring about adhesion of opposing surfaces them open, in order to produce recent and healthy that they may heal up soundly from the bottom. time we must attend closely to the patient's gen seeking to maintain the secretions in a natural Various agents have been employed to stimulate t fistulæ; one of the best is the concentrated tinctur rides, applied on a camel's-hair brush, or with a fi Solutions of the sulphate of zinc or copper, and of th silver, injected by the syringe, sometimes give g An excellent mode is to introduce carefully, as far a small and flexible silver probe, coated with nitrat a plain probe having been introduced beforehand as the length and direction of the passage. It often h the external orifice of the sinus is smaller than any in such a case, a little caustic potash should be app purpose of enlarging it, and so permitting free rem discharge.

The application of compression to the fistulæ has several times, and success has been claimed for it in two or three cases; in one of which, all ordinary means having failed, a cure was obtained by making the patient apply firmly to the perineum an india-rubber ball, inflated with air, on every occasion before making water, and for some minutes afterwards. This plan was studiously followed during fifteen days, when the opening had soundly cicatrised. Four months after, the patient was perfectly well.

The cure of obstinate urinary fistula has also been attempted by introducing a catheter, and permitting it to remain in the urethra for days together, on the principle of insuring, as it has been supposed, the passage of the urine through the instrument, and thus preserving from irritation the fistulous passages. Little, however, is thus gained; for experience shows that, however large the instrument may be, and however closely it may fit the urethra at the present moment, before thirty-six hours have elapsed it will lie loosely in the canal, and urine will pass by its side. It is not possible, indeed, to remove urine from the bladder for any lengthened period by this means without inducing suppuration in the urethra, which is a bar to success.

It is better to withdraw all the patient's urine, by introducing a catheter three or four times a day, or more frequently if necessary. When the patient can do this cleverly for himself, and thus insure, at every want to pass urine during a period of several weeks, that it is carefully removed without contact with the urethra, a most successful result may be hoped for. I have had an instance of this under my own care, where a large portion of the floor of the urethra being lost, the opening closed after three or four months' attention to this practice.

Free incisions through the fistulæ, down to their origin in the urethra, or nearly so, have been found successful in inducing a healthy process of granulation from the bottom of the wound, and thus in ultimately closing the unnatural passages; provided always, however, that there is no obstruction to the free egress of the urine by the urethra, otherwise no such measures can be of any service. In some cases in which external division of the stricture on a grooved staff is indicated, this operation may be performed in such a manner as to include the fistulous opening in the incision, in which case a successful result may generally be reckoned on. Old chronic perineal fistulæ are sometimes better dealt with by the galvanic

cautery than by any other metho
of fistulous passage, communicati
sometimes follows the operation o
often successfully treated by the
heated to intensity; the best mea
doubtedly the galvanic current,
produces the required temperatur

A fistulous passage is sometim
the presence of a small calculus i
may be a small concretion which
or a deposit from unhealthy urin
sinus. Sometimes it occurs in fis
prostate, or with a prostate whic
formations. Fistula associated
ever, exist in the absence of any
which are sometimes connected
which are generally exceedingly o

Fistula is not necessarily a c
urethra to the surface; opening f
may have a blind or cæcal ext
fistula' has been described. A sn
by a collection of matter, and h
the urethra, constitutes the gene
variously accounted for; some be
others of inflammation of the mu
Until the tumour is opened ext
when it becomes a fistula of the
ment already indicated.

Urethro-rectal fistulæ sometim
stricture or abscess, and more
In either case their existence is
passage of liquid in an unusual
anus; sometimes by the appeara
urine or by the urethra.

I have recently treated a case of urethr
twenty years of age, in whom it resulted
gonorrhœa. The urine passed freely by t
various means, the use of the catheter, &
by placing him flat on his face during th
urine passed by the urethra. This plan w
Urine ceased to pass altogether by rect
could pass it in the upright position w
remained soundly healed ever since.

If such a plan does not succeed, the actual cautery, and particularly that heated by the galvanic current, affords the best chance of success. It may be applied through the rectum; a speculum having been first introduced, and a full-sized sound carried into the bladder. On the day before the operation the bowels are to be freely purged, and cleared by an enema an hour or two before the application of the cautery, after which they must be prevented from acting for two or three days. The cautery is to be re-applied two or three times if necessary. If the opening is large, the edges should be pared and brought together by silver sutures, after the method of Dr. Marion Sims.

3. The third class of urinary fistulæ comprehends those unnatural openings into the urethra which depend upon actual destruction of substance from the walls of the urethra and superjacent parts. The common causes of these are, sloughing from extravasation of urine, simple and phagedænic ulceration, and mechanical injuries of various kinds. They are for the most part larger, although not invariably so, than any of those already referred to. Generally a portion of the floor of the urethra is destroyed, as well as the structures which have intervened between it and the external surface; so that in many cases more or less of the mucous membrane of the upper aspect of the canal is visible from the outer orifice. As a consequence the whole, or nearly the whole, of the urine passes by the artificial channel in a full stream. Such apertures may be found before the scrotum, and are called ante-scrotal or urethro-penal fistulæ; or in or behind the scrotum, known simply as scrotal and perineal fistulæ.

A broad distinction exists between these two classes in relation to their amenability to treatment, and to the nature of the operations necessary to their cure. Ante-scrotal urethral openings are the most difficult to close, since the coverings of the urethra here possess but little substance. And further, owing to the extreme mobility of the member, and its liability to erection, it is difficult to maintain that perfect steadiness of position so desirable in a part which is the subject of an autoplastic operation. Nevertheless, with all these difficulties, in addition to that formidable one, the contact of urine, such openings, even when large, are not to be regarded as beyond the reach of surgical skill. The exercise of considerable patience, and of unremitting attention during a long period, is indispensable both to the surgeon and to the patient in a case of ureti penal fistula requiring a plastic procedure for its cure.

Openings in the perineum involving loss of substance, altho by no means easy to close, are remediable with less difficult account of the absence of the conditions just adverted to a obstacles in ante-scrotal fistulæ.

Treatment.—Ante-scrotal fistulous openings which are of size, but obviously depending upon loss of substance in degree, have been closed by repeated applications of a ca agent to their edges and to the surrounding parts. Of the nitric acid, the nitrate of silver, or the strong tinctu cantharides have been successfully employed in very openings.

Dieffenbach used the cantharides, and sometimes com with it what he called 'the lace suture.' This he describ applicable to small fistulæ in the anterior part of the The margin of the fistula and the surrounding skin mu frequently touched during the day previous to the oper with the strong tincture of cantharides. Before usin suture, the loose epidermis is to be removed by scraping, sound introduced into the urethra beyond the opening. operator is then to take 'a small curved needle, sharp point, but not at its edges, with a stout silk waxed thread by means of a needle-holder to introduce it beneath the s about three lines from the border of the fistula.' The po the needle is to be carried deeply, but not into the urethr made to emerge at another point, about three lines fro margin of the fistulous opening. By three or four of stitches, the thread is to be carried round the opening, u finally emerges at the point at which the needle was orig entered. The thread is imbedded in the cellular tissue a the fistula, at about three or four lines' distance from it ends are now to be drawn together slowly, so as gradu approximate the borders of the fistulous orifice until it literated, and then to be fastened by a knot. In three c days the ligature may be divided and drawn away. commonly, however, some plastic operation is necessa these openings. The proceedings of Cooper and Earle, th on record, are the basis of many various proceedings sinc ployed. Space does not admit of the necessary description Two of the modes employed for ante-scrotal opening ar scribed in the Essay on PLASTIC SURGERY: I have others in the second edition of my own work on Stricture and Perineal Fistulæ in some detail.

Retention of urine.—By this term is generally understood a condition in which the patient is unable to pass any urine whatever, or only an extremely small quantity; and is in danger of serious consequences if not relieved at no distant period. Urine may be, and often is, habitually retained in the bladder, while the patient nevertheless passes as much in the twenty-four hours as the kidneys furnish, the reservoir remaining more or less filled. This is engorgement of the bladder, and is not retention, which term is held to indicate an acute and not a chronic condition.

Retention of urine may be caused by simple prostatitis, usually occurring in young and middle-aged subjects; by stricture of the urethra, usually in middle life; and by hypertrophied prostate, in elderly persons only.

The consideration of the first and second forms will come next in order here.

Complete retention.—When any degree of organic stricture exists, however slight, retention of urine is always possible if exposure to the influences of certain exciting causes takes place. Occlusion of the passage may be caused by inflammatory engorgement, or unwonted muscular contraction; more frequently, perhaps, by a combination of both. Sometimes it may be caused by a foreign body, as a small calculus, a portion of a membrane, or the like, obstructing the stricture; and this is probably the rarest form.

In treating retention, the catheter is the first means required in nine cases out of ten, and often the only means. The first point to be ascertained is, is it a case of merely temporary obstruction from inflammation following gonorrhœa, or does it depend on organic stricture of some standing? The next points are the duration of the attack and the condition of the bladder, bearing in mind that while some patients may exhibit distension of that viscus almost to the umbilicus, the subject of an old stricture may be in a state of greater danger, although no distension is perceptible above the pubes, owing to the contracted condition of the bladder, which has become natural to him. The treatment varies somewhat in the two cases just briefly described. In the first case, or that of temporary inflammatory obstruction, it has been recommended to employ baths, opium, and depletion before

using the catheter; and relief may certainly be afford
this manner, although at the expense of prolonged suffer
the patient. The object of this plan is to avoid injury
urethra in its inflamed condition; and if the surgeon
gentle, or is not skilled in the use of the catheter, it is pr
the safest course to follow. But if he employs a light an
ful hand, a catheter of rather small size, say No. 4 o
gum-elastic or silver, the former producing less pain, sho
at once passed into the bladder; and in these cases
generally easily accomplished, if the flexible instrument
a good curve after the stilet is withdrawn. If the s
does not succeed in passing an instrument, the patient
be put into a hot bath, 100° to 103° or 104°, to relax spa
relieve internal congestion; a full dose of opium should b
by the mouth; and if there is much straining, an ene
suppository containing opium may be also administere
advantage.

If there is much inflammation about the parts, as sho
a swollen penis, urethral discharge, and tender per
cupping or a dozen leeches on the latter region are de
useful, in the event of retention persisting; generally, ho
some relief follows the use of the bath and the opium,
latter may be repeated two or three times, to insure i
action on the system. There are very few cases among
here regarded as inflammatory or spasmodic that will not
sometimes slowly without further catheterism, sometim
means of an instrument, which may often be passed with
parative ease after the treatment described.

There are some instances where the difficulty seems
spasmodic than inflammatory, in which repeated doses
tinct. ferri sesquichl., that is to say 15 or 20 minims
quarter of an hour, administered four or six times, relie
retention. When, on the other hand, we have to deal with
tion resulting from confirmed organic stricture, it is bet
once to examine the urethra in the usual way, that is, w
full-sized instrument; and, having ascertained the loca
the obstruction, patiently to devote a long time to the c
use of the smallest catheters, silver and gum. In relation
management, see pp. 957, 958, on Catheterism in difficult
If this proves unsuccessful, the hot bath must be resorte
and after faintness has been induced, the catheter may be
employed while the patient is still in the bath.

Further treatment, if necessary, must depend upon the condition of the patient. Generally, opium should be given by enema and by mouth, after which the catheter is again to be used. The time which is to be devoted to the employment of all these means must be regulated by the judgment of the surgeon. The condition of the patient, and a knowledge of the time during which absolute retention has existed, will enable him to decide the question of affording relief by some other measures. Chloroform is an agent of great value in obstinate retention. It relaxes the muscles; by causing insensibility it overcomes involuntary resistance and straining, and thus enables the surgeon to use the catheter with greater advantage, although not with more force than without its influence.

But supposing none of the treatment hitherto employed has been successful, that the patient's condition is urgent, the next proceeding is to afford relief by making an artificial opening either into the bladder or the urethra.

To effect this, the following operations are employed:

The stricture may be 'forced;' or, the urethra may be opened at or behind the stricture; and the bladder may be punctured, either by the rectum, above the pubes, or through the pubic symphysis.

1. The first method, or 'forcing' a stricture, is rarely performed now with deliberate intention. It consists in driving a catheter of moderate size forcibly through the obstacles which oppose its course, in the direction of the bladder, which when reached is evacuated, and the instrument is tied in. I have seen it successful in old, hard strictures. But it is not a proceeding which can be recommended in competition with those less harsh and dangerous proceedings which are generally practised by modern surgeons.

2. The urethra may be opened, first, by a dissection from the surface to the stricture, and through it, according to the method already described as perineal section (p. 974); secondly, the urethra may be opened behind the stricture, the bladder relieved, and the obstruction divided subsequently. Both these are difficult operations. Especially when the perineum is thickened and indurated, it is by no means always certainly possible to dissect through the stricture from the front, or to hit the urethra behind the obstruction. The perineal section, under such circumstances, often fails to trace the narrowed channel, and sometimes even to discover the urethra at all; and

a prolonged operation, with much loss of blood, not unfrequ results in failure to relieve the patient.

The method of opening the urethra by an incision altogether behind the stricture was recommended in this co by Guthrie and Liston, but is very rarely performe puncture of the bladder per rectum being now generall ferred. The operation is performed by introducing th forefinger into the rectum, to distinguish the apex of th state, and entering a straight sharp-pointed bistoury wit right hand just in front of the anus, so as to hit upon the u at the point indicated by the finger in the rectum. The is carried upwards exactly in the median line, so as to ma incision of one or two inches in length. In this mann urethra is to be sought, and the stricture afterwards d forwards or not, as the operator determines to be most able.

3. The bladder may be punctured in two principal way by the rectum, and above the pubes; to which may be ad third, through the pubic symphysis. Formerly it was punctured by a direct stab from the perineum—a dang proceeding, now wholly obsolete.

Puncture by the rectum is the operation most commonly ad at the present day. Its results have been carefully studi late years, and have been brought before the profession prominently by Mr. Cock, who has done much to test its The result of his conclusions is, that it is fraught with danger, and is more easy of performance, than any other is adopted for the relief of retention. The objections mad are: the liability to abscess between the rectum and the bla a persistent fistulous opening there; injury to the se vesicles, leading to suppuration of the testicle; and danger of perforating the peritonæum with the trocar, and inducing inflammation of that membrane and a fatal r The last-named, and the most serious, of these acciden happily that which may most easily be avoided. After a amination of several cases by dissection, it is my opinion the peritonæum is out of reach of the trocar when emp with a moderate degree of care. The puncture usually short of the peritoneal pouch by an inch at least. The results do occasionally, but only rarely, occur.

The operation is thus performed:—The rectum being em by an enema, the patient is placed in the position for lithot and firmly held by two assistants. The operator then introduces the left forefinger, oiled, into the rectum, and defines the posterior margin of the prostate, beyond which the finger should be extended if possible. Fluctuation should be obtained there, from the contents of the bladder, by a tap made on the hypogastric region, unless the viscus be very contracted indeed, in which case the propriety of operating is doubtful, since the trocar may enter the opposite coat of the bladder, from absence of the requisite amount of distension. Having determined the spot at which fluctuation is most distinct, and directed an assistant to place a hand on each side of the supra-pubic region to support the bladder, a well-curved trocar, seven or eight inches long, is carried along the finger in the middle line to the part indicated, the handle well depressed, and the point carried through the coats of the rectum and bladder, until it is felt free in the cavity of the latter. The stilet is withdrawn, and the canula, or a flexible tube passed through it, retained by a bandage and tapes. The length of time it should remain will depend on the amenability of the stricture to treatment. If this yields, the urine will pass through the natural channel, and the opening in the rectum will readily close. Little fear need be entertained of the continuance of a fistulous opening; for on several occasions on which the canula has escaped by accident, it has been impossible to replace it, and a fresh puncture has been necessary. When it is impossible to find fluctuation by the rectum, or when the prostate is enormously enlarged, this operation, as a rule, is not to be employed.

Puncture of the bladder above the pubes is performed as follows: The patient being placed in a half-reclining position, and the pubes shaved, a vertical incision of the integument is made directly above the symphysis pubis, about an inch and a half or two inches in length at the surface; this is to be carried downwards through the linea alba, so as just to admit the tip of the finger to reach the distended bladder. Meantime an assistant, standing behind the patient, places one of his hands on either side against the abdominal walls, so as to steady the bladder. A straight or a slightly-curved trocar (if the latter, the convexity of the curve should be upwards) is then to be carried with a very little inclination downwards into the bladder. After the operation the canula should be exchanged for a silver tube, specially adapted to slide through it, secured by tapes and a T-bandage, which may remain a day or two until lymph has

been effused upon the edges of the w
drawn, and a gum-elastic catheter
ment which is generally better toler
made of metal. For most cases of
ration is required, this mode of per
still the most desirable to adopt.

But a very ingenious proposal, or
with Dr. Dieulafoy, and since twice r
must not be left without notice. D
'aspiration' apparatus to the disten
the following manner. He inserts a
than a small exploring needle, close
mour; if it reaches the bladder a dr
he now applies the vacuum instrume
urine instantly appears and soon fills
charged by a side tap, a new vacuu
the piston, and the process is repeat
or four pints of urine may be withdr
in fifteen or twenty minutes, and th
scarcely perceptible puncture. I ha
apparatus to the bladder, although I
perfect action twice in paracentesis t
of the bladder were sufficient, this v
suffice, but if a route for succeeding
quired, as is almost always the
necessary. Still the large trocar ge
means necessary: thus my own troc
pubes is only equal to a No. 6 cathet
ciently large for all purposes. By m
by screwing to its end an additional
a gum-elastic tube may be slipped int
the trocar and canula when these are

The puncture through the symphysis
Dr. J. M. Brander of Jersey, in 182
cases have since occurred in the prac
He has usually employed a hydrocele
the operation, which is thus perform
cline, and the trocar is introduced—w
minary division of the integuments or
immaterial—about the centre of the s
above downwards, and in a direction a
vertical axis of the body. Dr. Bra

liquely downwards and backwards towards the sacrum, varying the direction according to circumstances; a piece of flexible catheter is then to be introduced through the canula,' and retained by a tape. I attempted to perform this operation some time ago, and could not penetrate the symphysis, although the trocar was strong and not large in calibre. With more improved methods of supra-pubic puncture, as above referred to, and by rectum, I should think this mode should not be in future considered, certainly in the cases of elderly persons where the cartilage is very firm or ossified.

In considering these methods of affording relief to the distended bladder in reference to any case which requires an operation, the question to be first solved is the following:—

Are the patient's powers and condition such as to compel us to prefer the simplest method of affording immediate relief, without regard to ulterior results? If so, unless the urethra can be felt in the perineum distended with urine, which may sometimes be the case, especially if that region be not thickened or deformed, the rectal puncture of the bladder, supposing the prostate not to interfere (putting aside the puncture by the symphysis, as not yet sufficiently tested by experience to be considered on equal terms with the older operations), is generally the simplest method, as it affords instantaneous relief at the smallest possible expense to the patient's powers. But if it is probable that the canula may be required for a longer period of time following the operation, I then prefer the supra-pubic method, especially if the bladder is distended, as it is inconvenient and distressing to a patient to maintain a canula in the rectum for more than a few days; whereas I have seen patients wearing with perfect comfort a tube for many years above the symphysis pubis. Again—but this is rare—if distension of the urethra is perceived in the perineum, a lancet or sharp-pointed bistoury may be carried into it, and a female catheter introduced by its side before it is withdrawn; or if the powers of the patient are good, and the condition of the parts is natural, perineal section may be employed. Having relieved the bladder, we can make a careful attempt to divide the stricture, by introducing a fine probe from below upwards through the stricture, and passing a catheter into the bladder. If, however, induration and deformity of the perineum exist, as above indicated, the crisis of retention is not generally a favourable time for adopting this proceeding.

The treatment of retention o
prostate.—When retention sudd
due to local congestion or infl
only after middle life, and de
much obstruction exists, very
excess in wine or in sexual exc
tention. When this happens,
necessary; for although partia
measures already described, wh
inflammation, spasm, and pain,
by any other than artificial me
hot bath and of opium has bee
are at once to use the catheter.
gum catheter, of good size, say
stilet, will often pass more easil
have been kept on an over-curv
in order to impart to it that p
the stilet, which is essential to s
scarcely possible to overrate
treated. But in the absence
cases where the prostate is un
employ a silver prostatic cathet
size than No. 9 or 10; it shoul
from the rings on the handle to
and the curved portion should
third of a circle, which meas
diameter; the mean of these be
useful size.

In passing the ordinary prost
with is usually confined to th
arrives at the neck of the bladd
requires to be tilted up over the
count a beaked catheter, that
lithotrite, will sometimes pass
Occasionally a stout wire stilet
of essential service, by permittin
of the instrument as required.
in practice a manœuvre of cons
having been originated by th
which may be thus described
stilet, having been introduced a
is then withdrawn about an

ncreasing the curve and elevating the point of the catheter, so s often to carry it over the enlarged portion in a manner less asily accomplished in any other way.

The question occasionally arises, is it desirable at once to vacuate the entire contents of the bladder when retention has xisted for a considerable period of time? In very rare instances he removal of a large quantity of urine, amounting to several ints, especially when an upright position of the patient has een incautiously permitted, has been followed by fainting and epression, from which he has never rallied. When the extent f vesical dulness is very considerable, it is therefore prudent o afford relief in a gradual manner; and, supposing that the atheter is retained, this may easily be accomplished. The removal of some thirty or forty ounces will probably afford comlete ease, and after the lapse of half an hour or an hour another ortion may be withdrawn; in this manner the bladder may be radually brought to adapt itself to the normal condition of ontraction, which subsequently, as a rule, must be insured at east once or twice a day. It is not long since my evidence was equired in a court of law, in a case in which death had occurred nstantly after six pints of urine had been suddenly withdrawn n the upright position.

A point of importance remains. A catheter having been inroduced with difficulty for the relief of retention, should it be ermitted to remain? The answer must depend on circumtances. In support of the negative, if the parts are already in state of considerable irritation, it is undesirable to permit any hances of adding to it, of which the presence of a catheter may e one. On the other hand, the bladder, after long retention, will very soon fill again, and less hazard may be incurred by the resence of the instrument than by a repetition of the efforts to lace it there, especially if great difficulty was experienced in assing it in the first instance. Greater weight usually attaches o the latter consideration, as a rule, than to the former. I ave often seen great danger incurred by the too early removal of a catheter which had relieved an urgent attack of etention.

If, however, which very rarely happens, catheterism proves nsuccessful, and relief is necessary, the bladder may be puncured or the prostate perforated. For the methods of perorming the former operation, see page 992. If the prostate e very large, the rectum is not so convenient a situation for

the proceeding as the supra-pubic
generally adopted. I have punctur
results for retention from enlarged
ting point was within reach of th
would be safe; this condition, how
exceptional.

Perforation of the obstructing por
performed with a strong silver cat
size, and rather longer than the
possessing the large curve of the ful
operator introduces this to the seat
himself by means of a finger in the
the urethra, and is engaged in the
carries it onward towards the cavity
the point firmly forwards, and at the
the handle; and he desists on feelin
cavity, and on finding that the urin
ment. This was done by Home an
a cutting stilet 'carried through
canula,' and 'practised the operati
Whatever be the instrument employ
maintain it in the middle line, and
point emerge just behind the neck
near the pubes on the one extreme,
bladder on the other. The cathete
be, should be retained not less than
in the bladder, that the tissues aro
difficulty be experienced in repla
withdrawn.

Extravasation of urine from rupt
place during unrelieved retention o
the urethra at some point; it is
bladder itself is ruptured. In eith
distension is not the direct nor th
the mucous membrane behind the
influence of urine in almost consta
breach of the urethral walls. Th
the urine with great force into th
superficial fascia of the scrotum an
occurs anterior to the membranous
ably the case. The situation of th

is characteristic in these cases, because the course of the extravasated urine is defined and limited by the union of the superficial with the deep layers of fascia at certain points. Thus the scrotum is first gently distended; a bag, as it were, being formed by the union of the superficial and deep fasciæ across the perineum, and by their connection with the pubic rami. As the fluid increases, it rises into the coverings of the penis and over the pubes and abdomen, but does not descend to the thighs, because in the line of Poupart's ligament these fasciæ are similarly blended, and prevent the passage of urine beyond their junction. The consequences of this extravasation are extremely disastrous; an unhealthy inflammation results from the irritating fluid wherever it goes, and the areolar connections of the skin and subjacent tissues are destroyed. If unrelieved, the distension becomes enormous, the scrotum sometimes attaining the size of a human head; the skin assumes a dusky red hue, or becomes purplish and livid; and gangrenous spots are sometimes apparent; not unfrequently such a one is seen on the dorsum of the penis, and is generally regarded as a very unfavourable sign, although by no means one that is necessarily fatal. The general condition of the system is one of great depression; and unless complete relief be afforded, the patient must inevitably soon succumb. He is frequently delirious, with brown tongue and extremely feeble pulse, when the extravasation is considerable.

In these circumstances it is necessary at once to make free and depending incisions into the distended parts. The scrotum especially demands a deep incision on either side the middle lines, frequently the pubes, and the penis itself also. These incisions will not only free the parts from the extravasated urine, but provide for its passage from the bladder. By these openings the purulent matters, débris, and sloughs will subsequently come away, often in very large quantity. No immediate measures for the cure of the stricture are necessary, as in the present state of the patient they are neither practicable nor advisable; although it is probable that when the retention is relieved a catheter may be passed into the bladder by the urethra; however, there is no occasion to do this until the system has rallied, which it often does to a marvellous extent. In a few hours the sufferer may emerge from a state of utter prostration to one of comparative comfort and promise; the symptoms of depression and exhaustion sometimes disappearing as by a charm, unless the injury inflicted has been too exte to admit of repair. Meantime, abundance of alcoholic stim and nutriment must be given to support the powers of Chlorate of potash, ammonia, and bark are often servic Opiates are rarely necessary, unless symptoms of nervous e ment appear.

However favourably the patient progresses, a consid amount of sloughing takes place. This is commonly th with the scrotum to a greater or less extent: both testicl sometimes completely stripped of their coverings, and ar bare in the wound, and even hanging by the cord. Durin process the removal of the products of decomposition an cleanliness of the parts must be provided for. Anti applications, frequently changed, as yeast or beer-ground tices, linseed-meal or charcoal poultices, with a few drops chlorides of lime or soda well stirred in, promote these cations. The use of the disinfecting chlorides, of carbolic or of powdered charcoal, and free ventilation of the room, s be adopted.

If the extravasation have taken place between the two l of the deep perineal fascia, a firm, hard, and deep- swelling may sometimes, but not always, be detected i perineum. This is to be at once freely opened. If it behind the fascia altogether—but this is very rare—the finds its way upwards around the base of the bladder, fatal result is inevitable.

Rupture of the bladder.—This accident is excessively except as the result of direct violence. It then usually o from a blow on the abdomen or from a fall, when the vis distended with urine. It may be occasioned by a fragme bone when the pelvis is fractured (see INJURIES OF THE P vol. ii.). When it happens as a sequence to stricture, it do by a process of the same nature as that already described as a ing the urethra, although it may not always occur in the bla properly speaking, but in a thin and dilated sacculus sprin from it. Occasionally the discharge of its contents takes directly into the peritoneal cavity, more commonly int cellular connections of the organ below the line of its perit coat, after which it may secondarily escape through the toneum or not. In any case a recovery has never been k to happen, and can scarcely be regarded as possible.

The symptoms of vesical rupture take place after a prolonged but not necessarily absolute retention, for some surplus of urine may have been previously escaping by the urethra. The patient usually states that he has felt something give way. Acute abdominal pain then sets in; the belly becomes exceedingly tender and distended; the features are pinched and anxious; the breathing hurried; obstinate hiccough occurs, sometimes vomiting; the pulse is sharp, quick, and irregular; the flow of urine ceases altogether, as also does the straining to void it. General fluctuation may be sometimes found in the abdomen, and inordinate distension of the bladder, before felt in the rectum beyond the prostate, has now disappeared. Sometimes the patient is delirious, and even maniacal. And after a period varying from thirty-six hours to four or five days from the time of the accident, during which the patient's agonies are extreme, death takes place.

The indications of treatment which, in the absence of experience, we should endeavour to fulfil, would be as follows: To provide for the free exit of the urine from the bladder by puncture; to alleviate suffering by large doses of opium, with hot fomentations and rubefacients to the abdomen; and to support the powers of life. Whether an attempt to remove the urine in case of extravasation into the abdominal cavity, by puncture of its walls, should ever be entertained, is an unsolved question. Such a proceeding affords the only chance (exceedingly slender as it is) of recovery which surgical aid could afford.

HENRY THOMPSON.

URINARY CALCULI AND LITHOTO

OF all the ailments to which the human frame is lia
of the formation of a stone or calculus in the
bladder, or urinary passages is undoubtedly one of t
formidable and important. And on account of the t
of this formation to become lodged in certain dilated
of the urinary apparatus behind natural necessary
ings, it is thereby rendered liable to increase in s
consequently soon to become impassable and incap
expulsion. The stone now acts as a foreign body, a
tates the delicate structure of the part in which it is r
causing at first local disturbance and mischief, aft
seriously involving the constitution, and ultimately lea
a miserable existence, which most frequently terminat
lingering death.

In order to comprehend more fully the subject in
bearings, it behoves us to take into consideration the
and formation of stone; and in doing so we must nec
review cursorily the circumstances which may give rise
affection, by passing in survey the more simple and
deviations of the urinary fluid, then its more agg
changes from the condition of health, until we arrive a
still more complex and dangerous forms which cause th
gamation of the deposits into a mass, constituting a sto

But previous to these inquiries, it is the essential
the surgeon to be well acquainted with the urine in a s
health, and in its varied conditions under every circum
He should know its chemical constitution, its specific g
its amount of acidity, its variety of colour, its micros
appearances, &c.; and not only this, but he must also
mind the changes which the urine undergoes during
conditions of the body, and during certain periods of th

thus there is the urine of the blood, passed early in the morning before any repast; the urine after the use of drinks; and the urine after the partaking of solids—all modifying the condition of the constituents. All these points are carefully detailed in our standard chemical and physiological works, and in the numerous special monographs on the urine, to which the reader is referred.

In making a careful analysis of the constituents of the urine, we find that there are two sources from which an abnormal condition may arise; and that an excess or deficiency of the elements from either of these sources may disturb the balance, and thus dispose to a precipitation of one or other of the constituents, causing deposits. The one source is from the organic elements, and of these urea and uric acid are the most frequent. Urea bears the proportion of 12 or 15 to 30 or 40 parts in 1000 parts of urine; it is exceedingly soluble and liable to decomposition with a development of ammonia, which is accelerated by mucus or other animal substances becoming putrid; this may take place in the urine in the bladder under certain diseased actions, and prove an abundant source for calculus. Uric acid, on the contrary, exists in very small proportions,—half a gr. to one gr. in 1000 grs. of urine; it is very insoluble in water, so that any excess of living, such as increased animal diet, will cause a ready deposition of this substance; hence the frequency of deposits and calculi of uric acid; and from this being the chief constituent of most stones, the deposit has derived the name of lithic acid. The other source is from the inorganic constituents, the salts of the urine; these comprise saline and mineral ingredients. The saline are soluble in water, and consist of sulphuric, phosphoric, and hydrochloric acids, in combination with their bases, potash and soda. The mineral salts are insoluble in water, and consist of phosphoric and occasionally carbonic acids, in combination with their bases, lime, magnesia, and sometimes alumina; traces of silica are occasionally met with. Of these salts the phosphates are the most important, as being more readily prone to be deposited.

*Urinary deposits.**—These may be advantageously arranged

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* In giving a description of urinary deposits and urinary calculi, the author has availed himself of the standard works: for more minute detail reference must be made to the works of Bird, Beale, Thudichum, Bence Jones, the Catalogue of Calculi of R.C.S. England, Hassall, &c.

under the foregoing two
urate deposits, with their
cystic oxide varieties, de
elements of the urine; and,
of lime, deposited from the
urine. But besides these t
to which we shall merely
into a description of the
products, such as blood, p
milk, fatty matter, &c.;
doubtful origin, viz. cyanou
blue. Two rare forms of d
will be alluded to under th

1. The *uric acid deposits*
lateritious sediment, comp

these crystals, however, ma
ducing a kind of sand, of
an inch in diameter, and
such masses may concrete
culus, called gravel, attai
capable of being passed
commonly consist of rhom
more or less rounded off, o
shaped plates; but the no
the addition of acetic, ni
may be separated from its
or six-sided prisms. Dr.

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[*] Beale,

of the crystal is much affected by the strength of the acid which s added; thus, where the acid is small in quantity, the crystals are regular, mostly tables, squares and lozenges; where the acid is in larger quantity, added to a strong solution of urate of ammonia, they consist of large and long tables, with very elongated lozenges; and where the acid is strong, and amorphous urate itself used, the crystals most frequent are acicular prisms. The causes which give rise to this deposit are described by Dr. G. Bird* to be: 1, the waste of tissues being more rapid than the supply, as in fever, rheumatism, &c.; 2, the supply of nitrogen in the food being greater than is required for the reparation of the tissues, as in over-indulgence, especially in the use of animal food; 3, the process of digestion being insufficient to assimilate an ordinary and normal supply of food, as in dyspepsia; 4, obstruction to the cutaneous outlet for nitrogenised secretions, as met with in diseases of the skin, variability of the climate, &c.; 5, congestion of the kidneys, following injury or disease of the organ. Imperfect respiration is also said to be a cause of an undue proportion of uric acid in the urine, owing to an excess of carbon and oxygen uniting with urea. The treatment to be adopted will of course be to control and remedy the cause by abstinence from over-indulgence in animal food, regular diet, exercise, free action on the skin by baths and moderate diaphoretics, mild diuretics, diluents, liberal use of good water, and so on.

2. The *urates*, generally known as the urates of ammonia, form the most frequent urinary deposits. Heintz† regarded these deposits as consisting of urate of soda and urate of ammonia, with traces of urates of lime and magnesia. Their colour is a pale fawn, but it may vary from snow-white, through every tint, to brick-red, pink, or purple. Dr. Bird remarks, that in the white, fawn, or brick-red deposit there is a deficient state of the cutaneous functions; whilst in the pink, crimson, or purple variety, there is more or less evidence of functional or organic derangement of the liver, spleen, or other organs influenced by the portal circulation, which is attributed by some to the presence of purpurine, and by others to the obstructed elimination of carbon, as in rheumatism, gout, and diseases of the liver or spleen. The alkaline urates generally form an amorphous deposit of minute spheres, having protruding there-

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[*] *On Urinary Deposits*, 5th edit. p. 159.

[†] *Lehrbuch der Zoochemie.*

from acicular spiculæ of sh
describe two forms of fawn
monia: the one, in which t
the supernatant fluid by sli
very homogeneous mixture,
repose; the other, with freq

Urat

uric acid forming a pale u
through the fluid in detache
subside, and occasionally fo
puriform mucus, disappearin
specific gravity. Sometimes
and often assumes a mucilag

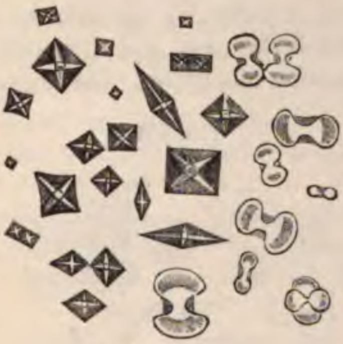
The causes and treatme
the uric acid deposit. Open
either mineral or vegetable,

3. The *uric oxide* deposits,
xanthine, closely resemble u
urine depositing them are u
depend upon an imperfect
which uric acid is eliminate
kidney.

4. The *oxalates* are usuall
lime, the crystals consisting
the quadratic octahedron cl
much shorter than the other
due to the position in which

lattened and square, and resembling the back of a letter nvelope. The other variety is the dumb-bell-shaped crystal: his is considered by many to be formed by oxalurate of ime, and by others to consist of uric acid, both of which allacies are explained in Dr. Beale's work, pp. 300 et seq. The dumb-bell crystals often unite into a mass, and form the ucleus of a concretion called the hemp-seed calculus. Dr. G. Bird considered these deposits to be due to an increased xidation of the uric acid formation, and believed that they ever exist in healthy urine, although their constituents are resent under one form or another. Lime is always present in he urine, combined with phosphoric and perhaps other acids; nd so great is the insolubility of the oxalate of lime, and so ntense the mutual affinity of its constituents, that the addition f oxalic acid as a soluble oxalate instantly determines the precipitation of the salt. The particular manner in which the volution of the oxalic acid found in the urine occurs can carcely be regarded as at all satisfactorily explained; most, owever, seem to regard it as a secondary product of the oxidaon of the saccharine matter occasionally present in the secreons, and thus appear inclined to draw a close analogy between e diathesis in which sugar and that in which oxalic acid is enerated. Dr. Prout maintained that oxalic acid is one of e results of imperfect digestion, and that it is derived from getable food, more especially such as contains sugar. Liebig ught that it arises from the imperfect oxidation of uric acid ring the metamorphosis of the living tissues; if the supply of ygen fails to a certain extent, the products of combustion

FIG. 302.



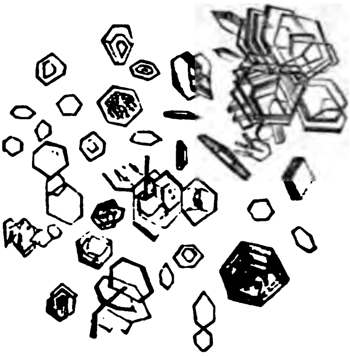
Oxalate of lime.

in the lungs are urea, oxalic acid, and the subs allantoin. Dr. Owen Rees* considers that the ox concretion is formed by the decomposition of uric urate in the kidneys or bladder; these are co oxalic acid, which unites with the lime, so that diathesis is an accidental and unimportant modifi uric acid diathesis.

The causes of this condition have been attribu nervous depression, as from grief, loss of blood, of course the treatment will be to counteract these to pay great attention to diet and the action of the to avoid all articles containing or liable to produ fruits, fermenting liquors, and substances into acid enters as a constituent; mineral acids are ficial.

5. The *cystic oxide* deposits, or cystine, are cons modifications in which the urea and uric acid are an excessive elimination of sulphur. The deposit is

Fig. 303.



Cystic oxide.

be bulky and easily diffusible, resembling in app white or pale lithates, and to consist of more or l six-sided plates, variously super-imposed one upon the centre portion of the crystals being somewhat o G. Bird believed that it does not exist in healthy rarely in morbid; but is probably derived from the tractive matter of the urine; and he inferred that from the waste of tissues and of the hæmato-globuline. In the majority of the sufferers the general health and nutrition have been bad. The indications for treatment are acids and tonics; such as nitro-hydrochloric acid, chalybeates, &c.

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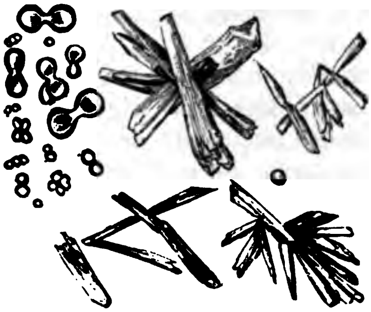
* *Croonian Lectures*, London, 1856.

We now come to the deposits, for the most part of inorganic origin:—

6. The *phosphatic* deposits. The phosphatic salts in healthy urine are of two kinds, the alkaline and the earthy phosphates. The alkaline includes the phosphate of soda, the acid phosphate of soda, and the phosphates of soda and ammonia, which are perfectly soluble, and do not give rise to deposits or concretions. The earthy phosphates, viz. phosphate of lime and magnesia, occur in very small quantities, and are eliminated in a perfect state of solution, but under certain circumstances and certain morbid actions are readily deposited and form concretions. These earthy phosphates are insoluble in water, but are dissolved by mineral acids; they are soluble in organic acids; albuminous substances dissolve them, but the salts are again readily precipitated by ammonia. Thus the phosphatic deposits are derived from the earthy phosphates of the urine, and comprise three varieties:—

1st. The *phosphate of lime.* The deposits of this salt, Dr. Bird observes, have led to more errors than any other class.

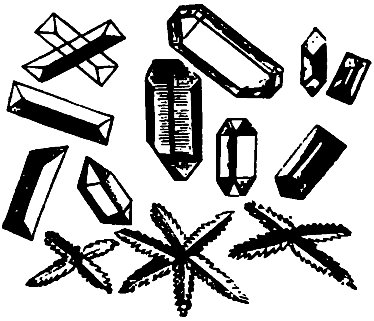
FIG. 304.



Phosphate of lime.

Where it exists in the urine in solution, or is precipitable by heat, it has repeatedly been mistaken for albumen; and where it has formed the great mass of a deposit, has as frequently been mistaken for pus or purulent mucus. The deposits consist generally of a white amorphous matter, not in crystals, but as minute granules; after standing for some days, little spher frequently found. Dr. Beale says that this phospha assume the form of minute dumb-bells; an appearan due to the adhesion of two little spherules, which become coated with a fresh deposit of the phosphate sall, in the *Trans. Roy. Soc.*, January, 1860, where detailed account of it, states that it is more frequent a crystalline form in the urine than in an amorphou He describes the crystals as either single or aggregat glomeruli or rosettes; and the more perfect crystals an oblique, six-sided, prismatic form.* 2nd. The *ammonio-phosphate of magnesia* (the triple phosphate o

FIG. 305.



Triple phosphate.

and ammonia) generally assume the form of crystals prisms with truncated extremities, the terminal edg are sometimes bevelled off; or of four-sided prisms a six-sided plates; or again, of stellate crystals, whe has been added to the urine. The urine in this va of a natural colour, of rather high specific gravity, times neutral, often acid, and seldom alkaline; pungent, disagreeable, and even fetid odour, whic usually, but erroneously, denominated ammoniacal deposits consisting of a combination of the two fo *the phosphate of lime* and *triple phosphate*, which is the *mixed* or *fusible* variety of phosphates.

The causes of phosphatic deposits are generally co alkaline state of the urine, from a diminution of the re- e acidity; this alkaline condition being due to local e, injury of the urinary organs, the presence of foreign s, or to general morbid conditions, such as over-exertion, depression, spinal disease, insufficient food, or abuse of es and medicines. The source of this alkali may be an s of carbonate of ammonia, probably effected through the um of a ferment converting the urea into a volatile alkali. , mucus altered by an unhealthy condition of the mucous rane may effect the conversion of urea into an alkali; so lso the presence of a fixed alkali, such as the phosphate la, produced during digestion. Dr. G. O. Rees maintains he alkali which causes the precipitation of the phosphate reted by the mucous membrane of the bladder; the earthy are precipitated from the urine, and not secreted from the us membrane, as was formerly supposed. The treatment h deposits will be the removal of all recognisable causes, as imperfect digestion and assimilation, improving the nt's powers, and correcting the morbid conditions of the ys and mucous membrane of the bladder.

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* Hassall, *Urine in Health and Disease*, 2nd edit. p. 2

The *carbonate of lime* deposits are of rare existence, gene- of secondary formation, and usually occurring in an amor- s form. Under the microscope they appear as small and te crystalline spherules. These often congregate together, ssume the shape of a drum-stick. The deposit is stated the result of such a state of enervation, that the bond of y, which in a healthy condition of the nervous system firmly united the elements of urea, becomes loosened; a ngement of atoms occurs, the urea becomes carbonate of nia, and, under the influence of ordinary chemical affinity, nate of lime is generated at the expense of the calcareous of the urine.*

ving thus taken a cursory survey of the formation of de- s due to changes in the urinary fluid, we now pass on to ore aggravated conditions, viz. the amalgamation or con- n of such deposits into a mass, forming a stone or calculus.

ormation of a calculus, in a practical point of view, may tributed to one of three causes: 1st, it may take place in ecreting cells of the kidney, by precipitation of the salts, as occurs naturally in the kidneys of reptiles and birds;

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* *Guy's Hosp. Reports*, series i. vol. vii. p. 224.

deposition of urate of ammonia, phos
amorphous ingredients, according to th
state of irritability or innervation pres
the bladder.

The simplest mode of witnessing t
stone is in cases where a gum-elastic ca
to remain in the bladder for some tim
urinary crystals and deposits are fo
Foreign bodies, no matter of what nat
bladder, cause decomposition of the uri
tion of its salts upon it. Solid substan
the mucous membrane of the bladder,
observes, causes the latter to secrete a q
which comes in contact with the earthy
cipitated around the foreign body. S
contrary, such as mucus, fibrin, &c., do
coat, but cause a precipitation of the or
around them, viz. the uric acid, urates
form stone.

Another, and by far the most frequen
of a vesical calculus is the escape from
which cannot pass with the urine th
which acts in fact as a foreign body, a
on its surface. Renal calculi † are for

tracting in bulk as the hardening process continues. Others maintain that the calculus is formed by direct precipitation of the salt. If an excess of uric acid be separated by the kidneys, crystals of uric acid are thrown down; the latter may also be derived from decomposition of the urate of ammonia—the more ordinary source.

The oxalate of lime calculus of the kidney, according to Dr. Prout's researches, is not generated in a perfectly healthy kidney, and two conditions are necessary to its formation: the first, that the oxalic acid should exist in the system, and be secreted with the urine; the second, that lime, in some shape or another (that is, the phosphate or carbonate), shall be furnished by the mucous membrane of the infundibulum. The triple-phosphate of ammonia and magnesia is rarely deposited in the kidney, but it may form a coating for the other calculi, if lodged for a considerable time in the organ. Its formation, according to Dr. Prout, takes place in the following manner: the urine, under ordinary circumstances, contains the phosphate of magnesia, which is held in solution, being a highly soluble salt. But in some cases of disease the urea of the urine becomes decomposed in the kidneys, and ammonia is evolved, which combines with the phosphate of magnesia so as to make the triple salt.

Dr. Beale[*] observes: 'It is not uncommon to meet with microscopic uric-acid calculi; aggregations consisting of uric acid crystals, which if retained might receive deposits of fresh material on the outside, until small calculi, varying in size from a mustard-seed to that of a pea, or larger, are formed. Microscopic calculi of phosphate of lime are by no means uncommon, and are often found in the kidney; but until a few years ago I had never had an opportunity of watching the formation of calculi composed of oxalate of lime. The nucleus of these calculi does not consist of mucus or epithelium, as in the phosphatic, but is of the same composition as the exterior.'

The formation of a calculus in the bladder without any previous nucleus of renal origin, or the presence of a foreign body, is due either to an excess of insoluble material and the immediate precipitation of the salts of the urine,—as in the ordinary forms of uric acid, urate, and oxalate concretions,—or to stagnation of the urine in the bladder, in consequence of

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[*] *On Urinary Deposits*, 2nd edit. p. 392.

paralysis, hypertrophy, chroni
the organ, as well as diseased]

Von Walther * maintains tha
as a medium between chemi
growth, and that it has alwa
the latter. Wetzlar † does not
necessary for the production of
in no respect organic bodies.
formation to fermentation.

The whole of the chemical cc
be held together by a kind o
be derived from animal matte
matter; and some affirm that i
or even pus. Mr. Coulson (i
Bladder, p. 343) thus sums up:
secretion of the bladder; Fourc
and sometimes to gelatine with
however, could not determine
fibrin, albumen, gaseous matter
it to consist of a mixture of gel
'that the smaller calculi are
mucus, albumen, or some other
which entangle, and ultimately
the more insoluble ingredients
as quoted by Gross, extends thi
of the concretion; he found t
animal matter enveloping the pa
of salts, bore a great resemblan
frequently detected in the ce
proportion of epithelial scales fr
fibrinous casts from the urinife

Urinary calculi may be arran
distinct classes, to which a thir
rarer forms. The first will incl
urates, with their modifications
cystic oxide; the second, the p
the varieties of phosphates; th
calculi of carbonate of lime, the
the silicious formations. Altho

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* *Journal für Chirurgie,*

† *Beiträge zur Kenntniss*

al elements of calculi, yet there are other chemical ingredients present in more or less quantities; such as organic matters, carbonate of magnesia, silica, oxide of iron, benzoate of ammonia, oxalate of ammonia, phosphate of iron, urea, clay-silica, &c.

The number of urinary calculi present varies; the renal are generally two or more, the vesical usually only one, and the prostatic very numerous: the vesical, however, may amount to 17, 242, 307, 678, and even to 1000, as stated by Dr. Physick.*

The size also is extremely variable, viz. from that of a pea, nut, or almond, to a cricket-ball; the phosphatic calculi usually attain the largest size.

The weight depends not so much upon the size as the composition of the stone, for the phosphatic are very light, and the oxalates very heavy; it may vary from a few grains to many ounces. The majority are under an ounce; the heaviest on record was 6lbs. 3ozs.† Recent calculi are heavier than old, as containing moisture.

The shape is not uniform, depending greatly upon the situation and composition of the stone; thus renal calculi are irregular, and often moulded to the form of the calyces, pelvis, and infundibulum of the kidney; those in the ureter are generally cylindrical; the vesical are more regular and of an ovoid form; the prostatic numerous, small and facetted, or pea-shaped. Again, uric acid and urate of ammonia calculi are generally smooth and regular; the oxalates tuberculated like a mulberry, hence the latter appellation; the phosphates irregular and contorted. But there are an infinite variety of forms, such as conical, pyramidal, triangular, cubical, square, rhomboidal, reniform, pisiform, cardiform, cuneiform, semilunar, &c. Some appear as if they had been actually divided by a firm cutting instrument; and in one case, in the Guy's Museum (No. 2136^{50}), the apparently divided portions seem as if they had again become cemented and framed in by a subsequent deposit. In the same collection (No. 2145^{35}) there is a cystic oxide calculus in the shape of an ear-drop. Some remarkable forms of calculi have been detailed in the Guy's Hospital Reports, series iii. vol. ii. p. 351, where the appearance resembles that of two calculi united by a transverse bar, from which circumstance they are

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* Gibson's *Institutes*, 5th ed. vol. ii. p. 220.

† Coulson, op. cit. 5th ed. p. 337.

of ammonia ; a yellow pale-brown
cinnamon-brown, the uric or xanthi
green, or even blackish-green, th
greenish hue, the cystic oxide. T
liable to modification, and give but

The odour of recently extracted ca
The phosphatic calculi are very am
oxalate of lime calculi on section ar
of semen. Some are affirmed to pos
that of castor or musk.

The consistence depends in a mea
sition, on the amount of cohesion o
presence of moisture or organic ma
soft mortar or sand to that of hard
are generally soft, the uric acid har
The crust is usually the softest part
the most dense. A stone of rapid f
one of long existence and of small si

The section of a calculus shows it
ordinarily presents a centre or nucl
part, and a crust or outside coating.
one and the same chemical material
form or simple ; when it is made u
the stone is termed mixed, heteroge
these elements may be so disposed
without any visible distinction of a

laminæ have been formed, periods have intervened during which no deposition has taken place. This remark not only applies to the different laminæ of a heterogeneous calculus, but to the different laminæ of calculi composed of the same substance; as, for instance, to the different laminæ of which lithic acid concretions usually consist. This explanation is in perfect accordance with the circumstances attending the formation of calculi, which often, as is well known, remain in the bladder for a great number of years without attaining any remarkable size. Moreover, the constant state of change alone, to which the urine in all individuals is liable, almost precludes the notion of homogeneity in a calculus. We may suppose, therefore, that certain changes take place in the urine during which the law of continuity of deposition is suspended, and the surface of the concretion becomes, as it were, *water-eaten*, and less apt for future accretion; in short, assumes all the properties of a heterogeneous substance. Under these circumstances, when a tendency to deposition occurs, it will have to commence *de novo*, and, as it were, on the surface of a foreign body. The consequence will be, that the adhesion between the new and the old coats or laminæ will be less firm than in the intermediate parts, and that a calculus thus formed will be disposed, when broken, to separate into concentric laminæ.'

Dr. Hodgkin* gives the following account of the *Structure and Character of Calculi*:—

A. *Calculi of a Crystalline Character.*—In many instances, the particles separated or precipitated from the urine to form calculi, assume a crystalline character; and the mode in which this crystallisation takes place around a small nucleus materially influences the structural character and the form of a calculus. The structure is radiated, and the form more or less rounded. Such specimens of calculi bear considerable analogy to certain zoolites, and to some specimens of radiated quartz. The cystic oxide affords one of the best specimens of decidedly crystalline calculi. Some of the phosphates appear to come next; and calculi consisting of oxalate of lime frequently present evident traces of crystallisation.

B. *Amorphous or Massive Calculi.*—The molecules which unite in the composition of these calculi do not possess a perceptible crystalline form, and the resulting substance is what the mineralogists would call massive, with no other indication of structural arrangement than more or less distinct traces of superposition in concentric layers. There is considerable variety in calculi of this description; some possessing granular texture, which might be compared to a coarse sort of sandstone, whilst in others it is soft and earthy, like some of the softest specimens of chalk or tufa. The lamellar arrangement is very differently perceptible in different specimens; in some it is strongl the calculi, which are easily crushed, separate in shell-like flakes in which the arrangement is less conspicuous, break up almost i all directions.

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* *Guy's Hospital Reports*, series i. vol. ii. pp. 268 et seq.

C. *Calculi Intermediate between Crystalline and Amorphous.*— as present a mammillated surface, and on close inspection o fracture appear to have their several lamellæ made up of short angles to the plane of the lamellæ. These are often an assembl crystals. This form of calculus is most frequent in those specim composed wholly or chiefly of oxalate of lime.

It is not unfrequent to meet with a model calcul nucleus formed of uric acid or urates, as urea is the stituent of healthy urine; the body composed of lime, which latter Dr. G. O. Rees regards as uric aci altered after secretion; and lastly, the crust forme phates, the result of irritation. When a calculus different layers, one deposit succeeding another in manner, it is called *alternating*. (See Plate, Fig. 9.)

For a careful analysis of the condition and relative of the constituents of urinary calculi, as regards th body, and crust, we must refer the reader to the stan on urinary calculi, and more especially to the Ca Calculi in the Museum of the Royal College of Su England, in which work also there are excellent colo of all varieties of calculi. In general, calculi are according to the apparent nature of the nucleus; an present this nomenclature is adopted, although D points out a fallacy when he states that it is importa in mind that the central part of the calculus which is the unaided eye is spoken of as the nucleus, while nucleus may be microscopic, and of a different comp the material which immediately surrounds it. The n many calculi, which apparently consists of uric acid, composed of oxalate of lime, around which the uric been deposited.

The nucleus, according to Dr. G. Bird's[†] observa usually found in the geometric centre of the calculus, o so; but it is occasionally remarkably eccentric, as reniform concretions; and in a few, several distinct n centres of deposition, are met with. In some rare in the concretion which forms the nucleus is found loos

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[*] *On Urine and Urinary Calculi*, 1861, p. 354.

[†] *Guy's Hospital Reports*, series i. vol. vii. p. 182.

the body of the entire calculus; a circumstance, in all probability, arising from a layer of blood or mucus having concreted around the nucleus, and the matter forming the body of the calculus having been deposited on this layer. In this case, on the whole becoming dry, the mucus or blood would be diminished to a very thin film, and the calculus would appear to contain a loose nucleus. In a few instances calculi appear to possess no nucleus, the centre being occupied by a cavity full of stalactites or mammillated projections, giving the idea of the external layer having been first formed, and the mammillated portions subsequently in the interior. In the Museum of Guy's Hospital this state occurs only in the uric-acid calculi. In one specimen in the collection (No. 2154) the central cavity is lined with fine crystals of triple-phosphate, resembling the crystals of quartz so often found lining cavities in flints. The explanation of the formation of such cavities is, that the original nucleus was either blood or mucus, which has disappeared by desiccation.

Although in an essay of this kind we cannot enter fully into the chemical analysis of urinary calculi, yet we have deemed it advisable to introduce the following oft-quoted table of Dr. Bence Jones,* somewhat modified:

Urinary Calculi.

A. Destroyed by heat; combustible; leaving only a small residue:

1. Become red on the addition of nitric acid, and form a murexide:

a. Soluble in carbonate of potash, evolving *no* ammonia; soluble incaustic ammonia, or potash; on the addition of an excess of acid crystallises in angular crystals; not soluble in water	Uric acid.
b. Soluble in carbonate of potash, evolving ammonia; soluble in water when boiled; solution in water with a few drops of ammonia, when evaporated, crystallises in needles	Urate of ammonia.

2. Do not become red on the addition of nitric acid.

a. Soluble in ammonia, *not* crystallising when evaporated: insoluble in carbonate of potash; dissolves without effervescing in nitric acid, leaving a lemon-coloured residue; soluble in strong sulphuric acid, not precipitated by dilution	Uric or xanthic oxide.
b. Soluble in ammonia, crystallising in six-sided plates when evaporated; soluble in strong caustic potash; the solution, when boiled for a few moments, on the addition of a drop of dilute acetate of lead, gives sulphuret of lead	Cystic oxide, or cystine.

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* *Medical Times*, October 1851.

c. With difficulty solul
with nitric acid
in caustic potasl
amorphous form
on ignition . .

B. Not destroyed by heat; no
1. Soluble with hydrochlori
soluble in mineral aci
acid, when neutralis
bonated alkalies and
dilute acetic acid, wit
2. Soluble with hydrochlor
soluble in mineral ac
in acid when neutrali
carbonated alkalies a
in acetic acid; deco
yielding carbonic ac
boiled with carbonat
in the solution and p
3. Soluble with hydrochlo
before or *after* heatin
a. Solution in acid wit
crystalline precip
phate of lime (b
blow-pipe, and g
solves in acetic a
b. Solution in acid wit
phous precipitat
phate of ammo
before the blow-
c. Solution in acid wit
partly crystalli
without addition
4. Not acted upon by acids
bulk of carbonate of so

We will now give a
calculus.

1. The *uric-acid cal*
discovered by Scheele
composed entirely of ur
the proportion to all ot
nucleus in compound ca
is generally light brown,
may vary from pale faw
resemble old mahogany
be coated with a crust

phosphate of lime, giving a white appearance; and the nucleus, although consisting of pure uric acid according to Dr. G. O. Rees, may be quite white, owing to the absence of colouring matter. The size varies greatly, and it often attains considerable bulk: the weight and specific gravity is intermediate between the oxalate and the phosphate; the form is generally ovoid, laterally compressed and smooth, but sometimes beset with small tubercles, which may be increased to such an extent as to make the stone resemble the oxalate of lime:* the calculus may also mould itself into irregular shapes in the locality in which it may be placed. The appearance on section varies extremely; Dr. Thudichum† describes it to consist of concentric layers of variable thickness, every layer preserving its own thickness pretty regularly all round the calculus; the texture is best seen on the surface; in the hard and pure varieties it is crystalline and fibrous, the fibres of each layer converging like radii towards the centre of the stone, and their fracture being almost parallel with those fibres; the less dense and pure calculi are of a more earthy character and amorphous in fracture, having no laminæ. Some few are so hard as to impart a ringing noise on percussion, a sharp sound like a pebble. Here the fracture is conchoidal, and such stones when broken, as in lithrotrity, form sharp angular fragments, which are dangerous from their tendency to wound the bladder and urethra.

2. The *urate-of-ammonia calculus* is not common; it was discovered by Fourcroy and Vauquelin in 1798 (see Plate, Fig. 2). In the Museum of the Royal College of Surgeons, Edinburgh, there are only 14 in 649 calculi, being 1 in 46; at Guy's Hospital Museum there are 7 in 394: but this substance forms an important constituent of compound calculi, varying from 1 in $3\frac{1}{4}$ to 1 in $7\frac{1}{3}$ of all calculi. The calculi are seldom large, rarely exceeding an inch in size, are generally ovoid and smooth, or sometimes slightly tuberculated on the surface. Their colour is very generally characteristic, being of a slate, pale greyish-fawn, or clay colour; not unfrequently they more nearly resemble pipe-clay in tint; sometimes there is an admixture of red or brown, and in rare instances pink layers are observed near the centre. In the Guy's Hospital Museum (No. 2213) there is a remarkable collection of 142 calculi removed from the bladder of one patient

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* See preparation No. 2125, Guy's Hospital Museum.

† Thudichum, *On Urinary Deposits*, &c. p. 111.

by Sir Astley Cooper
rounded at the edges
pipe-clay, and are chie
curious that the patien
on examination prove
Their consistence is u
and they have a fine e
calculus (Guy's, No. 21
running through it, as
reframed by a deposi
present the distinct co
generally appearing h
thin laminated conditi
readily explained by th
the urate is deposited i
observed in children, a
tional disturbance.

Calculi of urates of s
are generally mixed wi
in the several layers
however (Guy's Hospit
calculus with a nucleus

3. *Uric oxide, or xan*
Marcet in 1815, is a
specimens are recorded

The calculus in which Dr.
eight grains, and nothing is
analysis: it does not exist i
Dr. Prout, Dr. Yelloly, nor
point. It was rediscovered
Langenbeck from a peasant's
it resembled a flattened pul
operation. The whole calc
tion was partly of a lustrous
brownish flesh colour. It w
any appearance of a crystalli
cleus, which did not, howev
the calculus. It was as hard
friction it assumed a wax-li
fragments of the calculus to
Royal College of Surgeons,
Museum (No. 2145⁹⁰). In th
of England there is a plate o

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* *Annale*

The calculus bears a close relation to uric acid, and seems depend on an imperfect oxidation of the material from which, the ordinary processes of the kidney, uric acid is elimi- ted.

4. The *oxalate-of-lime calculus*, discovered by Wollaston in 97, is the next most frequent after the uric-acid calculus, and rs the ratio of 1 in 14½ to 1 in 20 of other calculi. These culi do not generally attain a very large size, but are very mpact, dense, and proportionately heavy. As a nucleus in mpound calculi, its proportion varies from 1 in 4¾ to 1 in 7½ e Plate, Fig. 4).

Dr. G. Bird* thus describes these calculi: Their form or ernal configuration is almost invariably that of a tubercular, gular, or spinous character, and rarely perfectly smooth, ich, together with their colour, varying from grey to a rich wn or almost black, has gained for them the specific name ' mulberry.' In some calculi the surface is studded with nes so acute and slender as to resemble thorns; in others re is a coating of acute octahedrons of transparent oxalate lime, giving an extremely beautiful appearance. Sometimes se crystals are opaque, and the octahedron is remarkably tened: the calculus then looks as if studded with pearl-spar.† G. Bird observes: 'It has been supposed that the spinous d irregular form of these calculi depends upon their being med in the kidney, and that they were casts of the pelvis and yces of the organ. This, however, is by no means sufficient account for their figure; for no calculus so closely becomes a t of the interior of the kidney as the fusible variety, and yet s ever presents a tolerably smooth surface, however contorted figure. It is, therefore, more likely that the constantly stalline state in which the deposit of oxalate occurs has more do with it; and without calling to our aid any very fertile gination, a tendency to a cubic or octahedral outline can en be traced to the entire calculus.' Sometimes these inter- s between the projections or spines are filled up by some orphous substance, as urates, or phosphates, thus giving the ole an ovoid character. The appearance on section is gener- y that of an imperfectly lamellated structure, the consecutive ers forming waving lines, and often resembling knotted

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[*] *Guy's Hospital Reports*, series i. vol. vii. p. 213.

[†] See Preparation 2139^{25} in the Guy's Hospital Museum.

heart of oak; occasionally there is seen a layer
lime arranged round the interior one with grea
having a remarkably radiated appearance, like a
nitely minute needles placed side by side, and
perfectly porcellaneous structure. In compound
oxalate of lime deposition gives to the character
remarkably beautiful appearance resembling that
tion agate.

The rarer varieties of oxalate-of-lime calculus
lowing:—

1st. The small, smooth, globular ‘hemp-seed ca
scribed by Dr. Wollaston, and thus alluded to: ‘It i
lighter colour, so as to resemble in hue as well as
the surface of a hemp-seed.’ There may be one or
they are generally found in the kidney.

2nd. Where the character of the calculus is crystalli
out, and it has a white or pale brown colour. T
consist of nearly pure oxalate of lime in a cryst
Dr. Yelloly, on analysing the calculi in the Norw
Museum, met with not less than twenty examples
tallisation. The author has removed by lithoton
consisting of pure oxalate of lime, and of a pale
which crumbled to pieces immediately after extr
cumstance which was due to the absence of any bin
there being no trace of animal matter.

The third variety is the pure white oxalate-of-l
This is of a milk-white colour, possesses a hi
surface, is of extreme rarity, and is generally, i
found in the kidney; its external surface present
but is perfectly smooth, though it may be sp
variety seems to have escaped the attention of wri

In the Museum of the Norfolk and Norwich Hospital are
the first, a moist preparation representing a renal calculus of
and of great magnitude; it occurs in the form of a single mass
distended pelvis. From this mass there branch out other
which fill up the infundibula. The whole kidney is greatly enl
is extremely white, quite smooth, very hard and compact, and
sembles Parian marble. The only circumstance known of its hi
preparation was removed from a man after death.

The second example is a small calculus, very smooth and sl

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* For the detailed account of this variety we are indebted
Williams, formerly House-Surgeon to the Norwich Hospital.

grains, about the size of a horse-bean, said to have been passed by an adult ale. On analysis it yielded oxalate of lime.

he third specimen is nearly spheroid in shape, and about the size of an nary marble; it is of a white colour, though not so polished as the above are; its external surface is covered with spines and tubercles peculiar to 'mulberry calculus,' which it most closely resembles in everything but ur. Its tubercles are smooth, i.e. they are devoid of crystals; its weight is -five grains. The catalogue informs us it was passed by a female, aged nty, who was pregnant at the time. On scraping its surface, and placing débris under the microscope, very minute octahedra of oxalate of lime detected; they were insoluble in potash and acetic acid, and thus dis-ished from other substances which they resemble.

reference to this Mr. Williams remarks:—'I am inclined to believe the pure white colour of the third variety of oxalate-of-lime calculus is to the circumstance that it is met with only in the kidney, and that while at organ it is not permitted to lie continuously in urine, and therefore ot acquire the dark brown or almost black hue which the oxalate-of-lime lus generally assumes when situated in the urinary bladder. The tuber-ed form of this calculus, in consequence of its roughness, causes the ous membrane of that viscus (the bladder) to pour out blood far more ently than any other variety of calculus; and there can be but little t that the colour is derived from the hæmotosin, which has been ab-ted by the urine from the blood-corpuscles, and remains suspended in

While in the kidney, the constant trickling of urine over this riety of stone gives rise to its smooth white surface.

5. The *cystic oxide, or cystine calculus*, discovered by Wollaston 1810, is a rare calculus (see Plate, Fig. 3). It differs from all thers in containing a considerable proportion of sulphur, no ss than two atoms being present in every equivalent of the ide. The calculus is not a product of the bladder, as its me would seem to imply, but of the kidneys; and there is a markable hereditary disposition to its formation, for out of collected cases, 10 occurred in four families, and in 3 cases e subjects of the complaint were brothers. Ten specimens the collection of Guy's Hospital were passed by the same tient, whose age was 30; 3 were passed in the year 1814 o. 2144), 6 small ones subsequently (No. 2145), and in 1828 other remarkable one, of the shape of an ear-drop (No. 45^{35}).

These calculi are usually small in size; the largest is in the iversity College Museum, and weighs 850 grs.; at St. Bar-

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Hæmorrhagic urine, filtered so frequently as to lose all the corpuscles, will found to possess the dark blood-stained colour notwithstanding.

yellowish brown: they undergo, howev
by long keeping, turning slowly from
Thus the calculus in Guy's Hospital
brown in 1817, now it possesses a r
Some consider that the greenish-blue
due to the presence of earthy phospha
remarks, 'It has been suggested to me
Dr. Willis, that this alteration in tint
upon changes produced by the sulphur
soft, and on section they present a v
structure, and exhibit no tendency to
centric layers; when scraped, they y
and form a perfectly white powder, w
brown or green. The fracture is crysta

6. The *phosphate-of-lime calculus,* dis
1797 (see Plate, Fig. 6), is likewise rare
uncombined with other salts; and it se
of other calculi. Calculi chiefly or ent
tolerably hard and smooth externally, no
asperities of the oxalate of lime, or the
figure frequently assumed by the fusib
they consist of two or three portions fitt
variety of ways.

Of three specimens in the Guy's Hospital Muse he one, as described by Wollaston, of renal origin, and consisting f neutral phosphate of lime; and these are usually pale brown, vith a smooth polished surface regularly laminated, and the aminæ so slightly adherent as to be easily separable into oncentric crusts; in some, radiating lines are seen in a direction erpendicular to the laminæ; these calculi contain a considerble proportion of animal matter. The other form is of vesical rigin, and composed of phosphate of lime, similar to that of ones, and hence often called 'bone-earth' calculi; they are nore common than the former, and constitute irregular masses esembling mortar, or a granular semi-crystalline powder, eneloped in a tenacious mucus. Dr. Taylor, in the Catalogue of alculi of the Royal College of Surgeons, England, has described ome specimens as consisting entirely of this salt.

The phosphates are scarcely ever succeeded by any other form f calculus, but there are three instances in which a phosphatic alculus was succeeded by uric acid or urate of ammonia, and n one instance it was followed by oxalate of lime; the general atio in which they succeed other deposits is 1 to $4\frac{1}{15}$. Foreign odies as a rule have earthy phosphates deposited upon them; ut there is one remarkable exception (Cat. of the Royal College f Surgeons of England, Plate iv. Fig. 6) where a slender piece f steel formed the nucleus of a large oval calculus, consisting lmost entirely of uric acid.

Respecting the earthy phosphates in calculi Dr. Thudichum emarks:—'Not quite 10 per cent. of all calculi have a nucleus f mixed phosphates; but these substances enter into the omposition of about 34 per cent. of all calculi, forming either heir body, one or more layers, or the crust. This shows that he presence of deposits of mixed phosphates in the urine carcely ever gives rise to the formation of calculus, but that he presence in the bladder of other calculi frequently cause a eposit of phosphates to be formed around them, in which espect every calculus is nothing else than a foreign body. For ch a concretion to form, it requires the presence of some inding material, such as ropy mucus, or a clot of blood or brin, in hæmaturia and chronic disease of the mucous memrane of the bladder.'

7. The *triple-phosphate calculus*, or ammoniaco-magnesian hosphate, also discovered by Wollaston in 1797 (see Plate, Fig. is rare.

There are three specimens of this calculus in the Museum of the Royal

8. The *fusible calculus*, or mixed
of-lime and phosphate-of-magne
discovered by Wollaston in 1797 (s
frequent of the phosphatic calculi,
$\frac{1}{12}$ of all calculi, being rarely succ
urinary deposit; their relative pr
lections are various, from 1 in 8½ t

These calculi grow to a consid
paratively light and of low specific
very irregular, and mould themselv
they are placed, often filling the i
becoming impressed with its rugæ;
and ovoid, at other times taking
shapes; where there are two or m
tetrahedral form. Their colour is
and their consistence is more fr
other variety, and is sometimes s
chalk.

Their appearance on section is t
(op. cit.): 'They are frequently con
which in general adhere but sligh
the laminæ shining crystals of the
observed; in some the laminæ are
form a white friable mass like ch

It generally constitutes the calculous masses deposited on reign bodies accidentally or intentionally introduced into the dder.

9. The *carbonate-of-lime* calculus, discovered by Brugnatelli 1819, is a very rare form indeed.

He describes* forty-eight small concretions extracted from the bladder of a ng man: these were of the size of a pea, lamellar in structure, and broke a shining fracture. He also mentions several ash-coloured calculi, six- in number, and of the size of a nut, which were composed of carbonate of with a trace of carbonate of iron: these were removed after death from bladder of a woman. Dr. Prout has also seen small calculi of this salt, these were perfectly white and very friable.

Guy's Museum, No. 2182^{77}, there are some calculi of carbonate of lime, mere traces of carbonate of magnesia and alumina; in one specimen, 2187^{50}, it constitutes the body of a calculus, being deposited of a snow- te colour, on a nucleus of uric acid. There are several in the Oxford eum, among the collection of Mr. Hitchins, and there is in the possession Ir. R. Smith of Bristol a remarkable collection of these calculi, some of h are figured in the Catalogue of the Royal College of Surgeons of Eng- , Plate xii. Figs. 3, 4, 5, 6, and 7. Of these calculi, five were extracted he lateral operation from the bladder of a boy aged sixteen, and the other en were passed by the urethra previous to the operation: these latter were e size of peas, of a rounded figure, and had flattened surfaces; they were pact and lamellar in structure, and their external surface was of a light wn colour. Those extracted by operation were exceedingly irregular, and r external surface dusted over with white powder: the largest was of the and figure of a large almond; when sawn through, the concretion showed concentric laminæ, but irregular waved lines similar to those of the mul- ry calculus. The largest was so hard as to require the assistance of the idary's wheel to divide it.

Prostatic calculi sometimes consist almost entirely of this bstance, but, as Dr. Thudichum observes, 'it is always ques- nable whether the lime or the carbonic acid were in any case rived from the urine.'

10. The *fibrinous calculus* of Dr. Marcet and of Dr. Prout is some not ranked among calculi, in consequence of its differ- so totally from those other concretions. Dr. Bird† says:— t must be regarded as a portion of dried inspissated albumi- us matter exuded from an irritated kidney, rather than as a culus produced under circumstances at all analagous to those other concretions. Several specimens exist in the Guy's seum of the pelvis of the kidneys and ureters being ob- ucted by clots of fibrin; but none of them present the hard

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* *Litologia Umana*, Pavia, 1819.

† *Guy's Hospital Reports*, series i. vol. vii. p. 180.

concrete condition of the calculus described by Dr. am not aware of this variety having been mentio other author except Brugnatelli, who, in his *Litolo* describes some calculi as consisting of crystallised they were passed by one individual, and each was ab of a nut. These pseudo-calculi appeared to cons coagulated albumen, which not unfrequently present able lustre and a vitreous fracture, although scarce to justify its being regarded as crystallised.' Son scribed it to resemble yellow wax in appearance, have regarded it as an elastic organic substance c to fibrine.

11. The *uro-stealith calculus* is another of the ps it is not decided whether it is a resin or fat, and its condition is entirely unknown.

It has been described in Heller's *Archives* (1844, p. 97, and 1 it consisted of several small bodies composed of a peculiar form which were passed by a man aged twenty-four, who suffered fro stone in the bladder. Dr. Moore of Dublin has confirmed the e substance, and has examined several specimens sent to him Adams of Dublin.[*]

12. *Blood calculi* have been but recently discove likewise pseudo-calculi.

Those described by Dr. Alison[†] were found in the infundib of the kidney of a painter, aged 52, who died of consumption occupied the pelvis, while the infundibula were tenanted by a f whitish-grey colour, with one exception small in size, about the pear-seeds, and wanting the ordinary physical characters of pho One calculus which occupied the infundibulum was the size of looked somewhat worn and disintegrated, and at one point re of decayed wood, and was black on one side from the presence of it was very light in weight, and was composed of blood and pho The black calculi, which formed the chief point of interest, we number, and ranged from the size of a coriander-seed to that of bean; when found, these black calculi were tolerably hard, but they broke asunder on handling; the fractured surface varied a l in some parts presenting a dark rusty appearance. Liquor pot them, and they were capable of partial combustion; the micro only amorphous particles, but Dr. G. O. Rees, with the assistanc saline solution, discovered forms which he considered to be t blood-corpuscles.

Silicious concretions are not met with; although sili found in other calculi, by Berzelius, Vauquelin, Fourcroy, and others. Those which have been extracted from the bladder have been pebbles or small stones introduced from without.

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[*] *Dublin Quarterly Journal of Med. Science*, May 1854,

[†] Dr. Scott Alison, *Archives of Medicine*, vol. i. p. 245.

There are certain predisposing causes and conditions which are supposed by some to influence the formation of stone, or tend to its production; to these we can only cursorily allude. Thus, respecting climate and locality, it is stated that calculus is more frequent in temperate than in warm and cold regions, but more especially in humid and moist countries of moderate and changeable temperature, such as Holland, France, England, and Germany. It is, however, met with very frequently in Egypt, Isle of France, Bagdad, Russia, and both the Indies. Even in some parts of the same country it is more prevalent than in others, as in Norfolk in England.

With regard to race, it is asserted that the disease is much more frequent among the white than the dark; and Liebig attempts to explain this by suggesting that the exemption of the people of China from gout and calculus is due to the urine containing large quantities of tartar. However, stone is excessively common among the natives of India.

In some cases it may be traced to hereditary transmission, especially where there is gouty diathesis.

The sex modifies the relative proportion, stone being less frequent in females than males, their proportion being 1 to 20 or 1 to 23. This is due to the peculiar anatomical disposition of the urethra in the female, viz. its shortness, and its capability of dilatation allowing the easy passage of a small stone; as also to the comparatively temperate and regular habits of life of females.

The age at which calculi are most frequently met with is said to be in the young and in old people. This can only be ascertained by statistics, which are for the most part imperfect. The table furnished by M. Civiale gives the following results of 5,376 cases: Under 20 years of age, 55·56 per cent.; between 20 and 40, 14·69 per cent.; between 40 and 60, 14·95 per cent.; and above 60 years, 14·76 per cent. That of Mr. Coulson,* of 3,264 cases: Under 20 years of age, 71·20 per cent.; between 21 and 40 years, 12·10 per cent.; between 41 and 60, 10·87 per cent.; and between 61 and 80, 5·72 per cent. That of Sir Henry Thompson,† of 1,827 cases: Under 20 years of age, 60·42 per cent.; between 21 and 40, 10·18 per cent.; between 4 17·56 per cent.; and between 61 and 81, 11·83 per cei

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* Coulson, *On the Bladder*, &c. p. 402.

† Thompson, *On practical Lithotomy and Lithotrity*, p. 269.

Sir H. Thompson's cases are derived from the en rience, during given periods of time, of the following l Guy's, St. Thomas's, University College, Norwich, C Oxford, Birmingham, Leicester, and Leeds. It is (a foot-note,* and we have rearranged the statistic from this table according to the different epochs or life. Thus, under puberty, from 1 to 13 years of age, 940 cases, or 51·45 per cent. of the whole number; ai may subdivide into two phases, viz. infancy and childh 1 to 5 years, 473 cases, or 25·89 per cent.; and boyh 6 to 13 years, 467 cases, or 25·56 per cent. At pul during adolescence and approaching manhood, from years, 228 cases, or 12·47 per cent. During the nex ceeding years, from 27 to 36 years, 80 cases, or 4·37 At adult life, from 37 to 49, 127 cases, or 6·95 per cen vancing life, from 50 to 70, 414 cases, or 22·65 per c in old age, from 71 to 81, 38 cases, or 2·07 per cent.

Mr. Coulson aptly remarks, 'that tables exhibiting ber of calculous persons at different ages of life do no liability of individuals to be attacked at these diffe

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* *Table of prevalence of Stone in* 1,827 *cases of Lateral Lithotom ages:*

Age.	No. of cases.	Age.	No. of cases.	Age.	No. of cases.	Age.
1	7	22	10	43	11	64
2	74	23	9	44	4	65
3	116	24	12	45	17	66
4	153	25	11	46	11	67
5	123	26	10	47	15	68
6	90	27	5	48	6	69
7	86	28	6	49	10	70
8	49	29	11	50	23	71
9	57	30	11	51	15	72
10	60	31	3	52	11	73
11	35	32	14	53	17	74
12	58	33	7	54	25	75
13	32	34	9	55	23	76
14	35	35	9	56	26	77
15	26	36	5	57	25	78
16	27	37	3	58	16	79
17	18	38	14	59	22	80
18	26	39	4	60	33	81
19	19	40	21	61	17	
20	13	41	4	62	22	
21	12	42	7	63	22	

Here, as in many other statistical tables, an error has crept in from not taking care to distinguish between absolute and relative numbers of persons living at the several periods of life enumerated. Corrected in this manner, the tables would show that children and young persons are less liable to calculous disorders than has been commonly supposed, and that from twenty years and upwards the tendency goes on increasing in a very remarkable manner to the end of life; or, as Sir H. Thompson puts it, 'that the proportion of elderly calculous patients to the existing population at their own ages is larger than the proportion of children afflicted is to the number of existing children.'

The condition and habits of life have some effect as a cause. Thus sedentary habits impair the functions of the skin, and give increased work for the kidneys; so also luxurious feeding and use of malt-liquors and nitrogenised food in excess furnish a source from which concretions are derived; again, indigestion, mal-assimilation and fermentation, impairment of the vital powers and acidity generated in the stomach, are frequent causes.

Respecting the exemption of sailors and soldiers from this disease, as alleged by Mr. Copland Hutchinson and others, we have not sufficient data to go upon.

Morbid states of the urinary passages may predispose to calculous formations, and more especially the presence of a foreign body, which is sure to cause a precipitation and deposit on its surface.

With regard to the influence of certain kinds of waters and spas, as a beverage, in inducing stone, it has been proved to be entirely imaginary; none of the forms of calculi correspond with the salts which exist in natural waters.

We shall now proceed to the description of the symptoms, effects, and treatment of urinary calculi as met with in the bladder, prostate, and urethra. Those of calculi in the kidney and ureter are described in the essay on DISEASES OF THE URINARY ORGANS, p. 187.

Stone in the bladder.—A vesical calculus may consist of every possible variety of the urinary concretions already described. Whatever may be the nature of the calculus, when once it exists in the bladder, it acts as a foreign body, and will give rise to sufficient evidence of its presence by inducing certain symptoms, so as to lead the surgeon to its detection. all these symptoms are not uniformly met with; they in degree and intensity, depending upon a variety and accidental circumstances, so that it will be have some standard as indicating the symptoms generally met with in patients suffering from a sto bladder. The symptoms are premonitory and act premonitory symptoms can exist only in those cases stone is of renal origin, so that in many adults and the vesical troubles are preceded by paroxysms of colic; but in general these antecedent complaints, the formation of stone in the kidney and its passage ureter, are so severe, that directly the calculus has bladder a more or less long interval of repose and allays all further suspicion, and nothing more is the complaint until the calculus has reached a suff to be incapable of being expelled through the ne bladder.

The actual symptoms or signs of a stone in the bla sist of two kinds; first, those evinced by the patien tions, &c., constituting the subjective or rational which offer but presumptive evidence of calculus; and those signs detected through the aid of mechanical m termed physical signs, the only real method of determ diagnosing the presence of a stone.

The subjective or rational symptoms consist of the complaints:—There is pain and sensibility, of a mo acute character, referred to the region of the bladd neck; this may amount to a mere uneasiness or sen weight in the bladder, perineum, or hypogastrium, w be so slight as to be unnoticed by the patient; o other hand, the pain may be very severe and intense, in paroxysms of great agony.* At first the pain is only intermittent, occurring during and after micturi more especially with the last drops of urine; and in this is so frequent, and is attended with such irritati extremity of the penis, that they endeavour to all drawing the penis and prepuce forwards; and this giv an elongated condition of the prepuce, which is generall with urine, as are also the fingers, causing them to emit a urinous smell. The pain is also aggravated in the acts of walking, riding, jumping, sudden exertions, jolting of the body, &c., and its intensity generally increases with the advance of the disease. Oftentimes the pain is reflected along certain nerves, inducing morbid sensations at their peripheral extremity; this pain is experienced in the extremity of the glans penis, in the scrotum and testicle, inducing contraction of the scrotum and swelling of the testicle, in the perineum, kidneys, down the thighs, &c.

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* The pain was so severe, continuous, and intense, that a bla Amsterdam, and a cooper at Königsberg, performed self-lithotomy.

John Hunter* quotes the remarkable case of the father of Lord Cavendish, who had pain in the left arm associated with calculus in the bladder, and this was the only indication of a want to make water. Some have had tormenting violent pains in the soles of the feet, with numbness and tingling.

The pain may last a considerable time, and then suddenly cease altogether, giving rise to the supposition of a cure.

Such was the case with the patient of M. Morand, mentioned in the *Mémoires de l'Académie des Sciences*, 1740, where a catheter detected a vesical calculus, but after that all symptoms gradually subsided, so that M. Morand was considered to be in error, and the patient bequeathed him his body to teach him a lesson; but on the post-mortem examination three calculi of the size of apricot-stones were found on one side of the bladder.

On the contrary, a stone may exist and grow to a considerable size without any evidence of pain, and then pain may all at once occur after some act of exertion.

Thus it happened in the case of a priest, who was in the act of taking some books off a shelf, when sudden symptoms occurred, after which the presence of a large stone was detected: here in all probability the calculus had been lodged and then suddenly ejected from its hiding-place.

Pain may be altogether absent; and such is the case when there is paralysis of the bladder, since then there is no desire to urinate, nor any efforts to expel the urine. After all, pain is no positive sign, for it may occur in other diseases; hence it merely directs the attention of the patient and surgeon.

In gouty patients a calculus in the bladder is attended with much pain and irritability, which is sometimes so severe that relief is anxiously implored.

Associated with pain is an alteration in the act of micturition: ordinarily there is a frequent desire, from irritation of the neck of the bladder, and there are futile attempts to evac last drop; again, during the flow of urine there one or more sudden stoppages, but for a moment c stream reappearing in the ordinary manner. At tim is experienced considerable difficulty in urinating, some rare instances this has amounted to retenti cases where the stone has attained a very large siz up and occupying the whole cavity of the bladder, inc of urine takes place, so that the urine flows in d bladder having no room for receiving the fluid. varieties are not peculiar or essential to the presence for they are met with in other diseases of the bla urethra.

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* Hunter's Works, edited by Palmer, vol. i. p. 321.

The character of the urine is of little assistance in nosis, for urinary deposits may exist without calcu calculus may be present without any deposit whatev urine may remain perfectly clear and natural for a lon it may also contain deposits, which may assist in asc the nature of the calculus; but it may become at any turbid and mixed with mucus, which will be deposite shape of a tenacious matter remaining at the bott sides of the utensil, as seen in catarrh of the bladde secretion may become retained in the bladder, and ma go decomposition, giving rise to a fœtid dirty-grey di or it may even assume a puriform character; or it may and entirely disappear for a short time. Albuminous now and then met with, and may be due either to the of pus or blood in the urine, or it may be owing to kidneys. Some practical deductions might be derive vestigating the relative importance of the different st quantities of albumen in the urine in cases of sto hitherto this has not been done. Lithotomy has b cessfully performed on many occasions in cases in whi has been a good quantity of albumen, even without blood.

Hæmaturia is not always present: it generally takes expelling the last drop of urine, and occurs from the contraction of the bladder upon the stone; it may als from sudden exertions—the jolting in a cart or carriage, of jumping, &c.; but by rest and the recumbent positio speedily disappear.

Sometimes an erection of the penis is an attendar ptom, and in adults now and then involuntary emissions of semen occur.

In some patients, especially adults, there is tenesmus and a sense of bearing down of the rectum, with frequent and fruitless attempts to pass a stool; in others, especially children, there is frequent defecation, and often fæces are passed at every act of micturition; prolapsus of the rectum occurs very frequently in children, and sometimes in old men.

The physical signs of a stone in the bladder are to be derived from artificial or mechanical aid from without, giving to the senses of touch and hearing on the part of the surgeon distinct evidence of its presence. The means of attaining this is by the exploration of the bladder with a solid metallic instrument, which on coming in contact with the stone, enables one to feel the foreign body, and on striking it produces a ringing noise or sound; hence the term 'sounding' given to the operation, and 'sound' given to the instrument used.

The sound is somewhat similar to a catheter both in size and form, but is made of solid steel, which is well polished on its exterior, its length and size varying according to the age of the patient undergoing examination. The handle of this instrument is expanded and flattened, and also polished, in order to give a larger extent of surface for the fingers and thumb of the operator to receive tactile vibrations. The curve of a sound is generally that of the ordinary catheter; some prefer it shorter, curving at an angle of 45°, and others almost straight, except at its lower extremity, where it is bent or curved, and made somewhat bulbous (see p. 926). The reason why catheters are not ordinarily used is, that they are bad conductors of sound, and the presence of the stilet in the instrument may give rise to a rattling noise, a source of fallacy. A sound with a large curve may glide over a calculus, when lodged in a depression behind the prostate: hence in such cases, one with a short beak and at right angles should be employed.

The position of the patient in sounding should be the recumbent one; but in obscure cases it is necessary to vary this, and even to explore in the standing posture. The rectum should be empty, and the bladder moderately distended with urine. M. Civiale generally injects water previous to sounding.

The sound should be introduced carefully and slowly, and allowed to glide along the canal by its own weight; no force whatever is required, and in general no pain need be given.

Having passed into the bladder, the point of the ins to be made to move gently from before backward, side to side, and is afterwards rotated slightly on e assisted at the same time by a partial withdrawal a duction of the point of the instrument. The operat facilitated in obscure cases by the introduction of the the rectum, or by making pressure with the hand pubes. In consequence of there being generally so about the rectum, the stone is found sometimes lod right side; large calculi are generally near the n bladder, small and medium sized calculi lie at the b right or left side.

Sounding not only enables the surgeon to detect th of calculi, but it assists him in ascertaining their size number, and sometimes density. The size is dete first traversing the surface of the stone with the con the sound from side to side, and then carrying the before backward. The presence of more than one be sometimes detected by careful exploration, althoug prove deceptive where a stone is very irregular. The of a stone may likewise be made out, as to its being free, or fixed and encysted; whether it be on the rig left side, at the base or in the walls, or in the upper p bladder.

The noise emitted on the striking of a stone with t has led to opinions that the size and density of the may be thus detected; for some writers affirm that s very movable calculi give but a feeble sound; smooth a calculi, as lithic acid and oxalate of lime, have a clear, sonorous character; the light, friable, and irregular on phosphates, emit a dull and scarcely appreciable sou smooth surface of a lithic-acid stone, and the rough i exterior of the oxalate of lime, may in most instances be by the instrument.

Difficulties and sources of fallacy in sounding are n unfrequent. Thus, a stone may be detected at one ti not at another, owing either to its smallness or to i temporarily caught up in the folds of the bladder; in fa stones easily escape detection, and readily recede be sound when the bladder is moderately full of urine; h such instances the change from the recumbent to th posture may allow the stone to fall on the sound; or ag evacuation of the water in the bladder by means of a catheter may cause the stone to be felt.

Sir A. Cooper (*Lectures on Surgery*, vol. i. p. 348) says:—'I have myself sounded and not detected a stone at one time, which I have afterwards felt. I have sounded and not discovered a stone which another surgeon has afterwards perceived. I cut a patient and extracted thirty-seven stones from his bladder, who had been sounded and declared not to have a stone.'

S. Cooper (*First Lines of Surgery*, p. 688) remarks:—'In sounding, how possible it is to mistake a thickened indurated bladder for a stone in that organ may well be conceived, when it is considered that Cheseldon, with all his judgment and experience, actually cut no less than three patients, none of whom had any stone in the bladder at the time of the operation.'

The principal difficulties and sources of fallacy are, however, a large and deformed bladder,—a contracted bladder, unable to contain urine,—a sacculated or encysted bladder,—an irregular hour-glass contraction of the bladder,—calcareous matter adhering to the walls of the bladder,—an enlargement and roughening of the prostate gland,—calculi in the prostate and urethra, and tumours at the neck of the bladder. Again, the calculus may be coated with blood or mucus. Some of these difficulties may be overcome by varying the position of the patient, by the use of sounds of different sizes and curves, and by moderately distending the bladder with two or three ounces of tepid water. The presence of a stricture in the urethra may offer difficulties, which must be overcome in the ordinary manner by dilatation.

Sounding may produce cystitis and peritonitis; hence caution and gentleness are necessary in its use.

In some instances exploration with a lithotrite has cleared up a difficulty; but care must be taken not to mistake the opening and closing of the blades for the sensation of a stone. When using the lithotrite and engaging the stone, we can take a very fair measurement of the axis and size of a stone, a point which will be referred to in the essay on LITHOTRITY.

Sir Henry Thompson has suggested and employed a modification of the lithotrite,* which may act as a sound, catheter, and measurer.

Exploration of the base of the bladder by the introduction of the finger into the rectum may lift the calculus out of the

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* Weiss's catheter-scoop with stop-cock. See Thompson, *On Pract. Lithot.* p. 219. This instrument in its original form was constructed for injecting and removing the débris of calculi from the bladder; by the addition of the stop-cock, it is also useful for measuring the size of the stone and for sounding. See the essay on SURGICAL INSTRUMENTS.

hollow, so that the sound may easily strike it; a
children and in some adults the stone may be felt
rectum. This examination likewise enables us
presence of polypi, tumours, scybala in the rect
other complaints as may give rise to the symptom

In the female, vaginal examination is most im
on making pressure above the pubes at the same ti
may in most instances be felt. Uterine disease,
fallacy as simulating stone, may thus be ascertaine

The employment of the stethoscope in the pubic
perineal regions is not attended with much satisfa
Succussion likewise is of little service; and whe
many stones the patients in their movements rea
the operation themselves, and acquaint their sur
matter.

The prognosis of this complaint must always be
character; there are no means whereby we can
disease, unless by removal, through operative meas
offending foreign body; otherwise death is the sure
at a more or less remote period. Spontaneous expu
stone through the urethra now and then takes
small, and in some rare instances nature has effecte
causing the stone to be extruded by ulceration t
rectum, vagina, or perineum. These, however, are
tional cases. The surgeon also has to bear in
although a stone has been successfully removed,
lated cases a second or even a third stone m
developed.

The progress and termination of the disease i
affected with calculi in the bladder are exceedingly
and productive of much anxiety. These, of course,
according to the condition of the calculus, the cons
the patient, and the age and temperament of the indiv
some rare instances there are no symptoms whatever,
is only after the post-mortem examination that the e
a stone has been ascertained. In others, again, the
may be sufficiently well marked yet not severe, an
prolonged over a number of years without exciting
distress or anxiety. But in ordinary cases there is
increase of the symptoms, more or less slow, but const
ing to great anxiety and inconvenience; the patient
thin and worn-out, the health impaired, the stomach d

l the secretions vitiated. The skin becomes dry and the ex- mities cold; the micturition frequent and distressing; and n atony and atrophy of the bladder takes place, so that there inability to void the urine except in the reclining posture: e urine, in consequence, becomes in part retained and underes decomposition, assuming an ammoniacal and offensive aracter. Much suffering now ensues; exhaustion, loss of eep, disturbance of digestion, and low fever set in; next, colli- ative diarrhœa, and speedy death.

Such are the ordinary results; but other changes may take ace and modify the progress of the case: thus, acute cystitis ay attack the patient, as evinced by the intensity of the pain, equent micturition, and muco-purulent condition of the urine; lceration of the mucous membrane of the bladder may ensue; cute or chronic inflammation of the kidney, or even acute uppuration of the kidney, may set in, and carry the patient uddenly off by uræmia or pyæmia.

There may be also hyperæmia, hypertrophy of the coats of he bladder, irritable bladder, catarrh of the bladder, dysuria, æmaturia, ulceration and sloughing, with perforation allowing he escape of the calculus into the peritoneum, rectum, vagina, r perineum; or pelvic cellulitis may be induced, followed by diffused suppuration.

Calculi may become encysted either by means of the formation of a hernial protrusion of the mucous membrane through the muscular coats of the bladder, or by the presence of a parietal abscess of the bladder opening internally and receiving the stone in its sac. Sometimes a large and heavy stone becomes lodged behind the neck of the bladder, and here forming a diverticulum or bed for itself, becomes more or less fixed.

The post-mortem appearances of those who have died with a calculus in the bladder will of course vary, according to the mode of death and the complications which have previously existed. Ordinarily they will consist of chronic cystitis and chronic inflammation of the ureters and pelvis of the kidney, with slow changes in the glandular structure of the organ.

The *treatment* will consist in palliating and relieving the immediate distress, and then resorting to such means as may produce a permanent cure. When a stone has arrived in the bladder we should acquaint the patient of the fact.

The palliative measures will comprise such treatment as may improve the general health and the secretions and excretions,

as well as relieve any complications which may exist, s
catarrh, cystitis, ischuria, enuresis, nephritis, prostatitis,
the methods usually adopted in such diseases. Great att
must be paid to the diathesis of the patient suffering
calculus, as evinced by the nature of the sediment p
whether it be lithic acid, phosphatic, or oxalate, and thi
be treated as laid down in the early part of this essa
careful attention to diet and regimen, due regard to the
of the skin and bowels, and the use of sedatives and an
to relieve pain; not forgetting to correct the nature
morbid urine by appropriate medicines, such as mucila
drinks, diluents, &c. Oftentimes the paroxysms of pa
relieved by the recumbent position, with the thigh
buttocks raised, and the body bent forwards to relax t
dominal muscles. A decoction of the triticum repens is
recommended by Sir H. Thompson as giving great relief

The curative means will comprise the removal of the
from the bladder; and three methods have been advis
adopted: first, the attempted dissolution of the stone by
cal and other agents, such as the far-famed 'lithontripti
the solution by electrolysis; secondly, the removal of th
by mechanical means without a cutting operation, s
dilatation of the urethra, and lithrotrity; and thirdly,
traction of the calculus by operative measures, commonly
by the term lithotomy.

The cure by lithontriptics has engaged the attention
geons, physicians, physiologists, and chemists, and ha
had recourse to by quacks and empirics of all descri
Dr. Prout has fully pointed out the importance of the a
tration of increased quantities of fluid in certain calcul
other affections, showing that many comparatively in
substances are slowly dissolved away by the frequent r
of the fluid in contact with them.

Lithontriptics have been employed internally, throu
general system, by the administration of certain medici
waters, as well as locally by the injection of solvents i
bladder and the use of electricity.

The constitutional remedies generally made use of co
the prolonged use of alkalies, but often to the detriment
general health; these are inadmissible in oxalate-of-li
culi, as the latter resist their influence; so also in phos
calculi they are prejudicial, inasmuch as acids are of

beneficial effect in arresting the growth of such stones; but in the lithic acid variety much relief has accrued, and in some instances the growth of the calculus has been decidedly cut short by the use of such alkalies. The alkaline waters are supposed by some to act not merely by a process of solution, but by causing a kind of disintegration of the component parts of a calculus. Liquor potassæ and the carbonates and bicarbonates of soda and potash are the usual medicines employed. The Vichy waters have become renowned as a favourite and useful remedy in calculous disorders; and in some instances persons having undeniable stone, as ascertained by sounding, have had their symptoms relieved, and even removed, whilst partaking of the waters. The Académie des Sciences, in reporting upon the use of alkalies in cases of calculi, thus sums up this subject: 'Although we admit that alkaline bicarbonates are not without influence on calculi, yet these present sufficiently great difficulties in their mode of application to cause them to be regarded with caution.'

Some prefer the use of the borate of soda, as being more energetic; and, again, others have suggested the use of gastric uice, malic acid, and the nitro-saccharate of lead as having dissolvent powers. The celebrated nostrum of Mrs. Stevens was made of calcined eggshells and soap.

However, up to the present time no satisfactory remedy has been discovered. The local use of lithontriptics, viz. the injection of solvents into the bladder, has also been sedulously tried, and many experiments have been performed on calculi to ascertain their solvents, which have then been employed by means f injection into the bladder through a catheter. Unfortunately the solution, if strong enough to be of any use, endangers he coats of the bladder, and when diluted its action is uncertain in the extreme. Diluted alkaline solutions are recommended for uric-acid calculi; diluted acids, such as the hydrochloric acid, for phosphatic;* and dilute nitric acid for oxalate of me. Salts of lead, carbonate of lithia, nitro-saccharate of lead ave been suggested; the latter as being less injurious to the bladder. The free use of double catheter and keepi hour every two or three d has recommended that the at a sufficient height abov catheter by a tube provide the flow of the solvent ma

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* Sir B. Brodie has shown that phosphatic calculi might be greatly reduced in ze, or entirely dissolved, by injecting a weak solution of nitric acid, two to vo and a half minims of strong acid to the ounce of distilled water.

Dr. Hoskins employed a weak solution of acetate of lead (gr. j. ad ℥j.) with a mere trace of free acid. With a phosphatic stone double decomposition occurs; hosphate of lead, in the form of a fine granular precipitate, and an acetate of me and magnesia are formed.

M. Pelouse, in the 14th Académie des Sciences, th been arrived at: 1st, the e calculi proceed very slowl animal matter which enter and baths never effect a cur problematical, and the dan balanced, as in lithotrity, b 4thly, although the combi creases the probability of proceed with lithotrity.

The dissolution of calcul its advocates. Sir W. B. (transmission of an electric structed instrument; but i attended with risks to the cessful efforts are those of solution of nitrate of potas a powerful galvanic batte positive electrode would de influence, and the potassa would dissolve it; so that them would be disintegrat ployed was from five to tw two to nine grains of uric-a at the temperature of the b to two grains per hour o four times as slow as upon and uric acid in alternating were dissolved per hour; twenty-five grains were dis (*Oester. Medic. Jahrbuch*, 18 calculus by the aid of elect ments on the living body w

Gruithuisen, in 1823, suggested the dissolution of stone by means of the galvanic pile, but no experiment has been made on man.

The removal of a calculus by mechanical means without the use of the knife is confined to a certain class of cases. In the early stage, when the calculus is small, we may assist nature in its expulsion from the bladder by administering alkaline purges, by dilating the urethra with a large bougie, and giving diuretics; the bladder should be allowed to retain as much urine as possible, and then a free and copious evacuation may carry the stone along with it. Should the calculus become lodged in the urethra, it may be extracted by means of forceps, such as described and used by Hunter, Civiale, Sir A. Cooper, and others.

In females this plan is very practicable, and we shall refer further on to it.

The removal of calculi by lithotrity, together with the arguments in favour of this proceeding, will be the subject of special consideration in the next essay.

We now come to the extraction of a calculus by means of an artificial external opening, a necessary operation when lithotrity is deemed unadvisable. This operation is termed lithotomy. There are three situations in which it may be performed, viz. in the perineum, in the hypogastric or supra-pubic region, and through the rectum; each of which will have to be considered.

1. *Perineal lithotomy.*—There are several methods by which we may remove a stone from the bladder through the perineum; but we shall at present only refer to the ordinary lateral operation, leaving the other modes to be described as attempted improvements thereon. The necessary requirements for the operation consist in having a firm, solid table, of sufficient height to bring the perineum in a line with the operator's face, he being seated upon a stool sufficiently low to suit the height of the table; the table should be narrow, so as to enable the assistants to have more complete command of the patient. Two rollers or bandages should be at hand for securing the proper position of the extremities.

The instruments employed are the following: a staff, which is to act as a guide or conductor for the knife to enter the bladder; it varies in length and size, according to the age of the patient, and consists of a grooved steel sound, curved like the ordinary

catheter, the groove being
convex aspects, and termina
the extremity, so as to preve
the knife. The staff has be
of facilitating the operatio
used a straight staff, which
all the surgeons of Guy's H
very long director, slightly
groove placed in the medi
shape and size, according t
common scalpel for the firs
is exchanged for a button
section. Liston performed
sharp-pointed, scalpel-shap
but his knife was slightly
it was longer in the blade
the same breadth. The k
smaller and narrower dime
A probe-pointed bistoury
subsequent enlargement of

Again, some experienced
early days, prefer completin
called a gorget; this is a
either *blunted* at the point
although in occasional use,
days—excepting, it may be,
perineum and of enlarged
make his requisite incisio
measurements. The forcep
to suit every variety of diffi
and the blades so constru
between them when closed
seized, may not be crushed
are curved, so as to seize th
upper part of the bladder,
larged prostate, or encysted
common dressing forceps, s
will answer all purposes.
proves at times an invaluab
in levering out fragments w
crumbled to pieces; but it
stone is small and eludes t

together with the aid of the finger, the stone may be readily drawn out by a kind of leverage of the scoop and finger in opposite directions. In Russia a kind of spoon is used in almost all cases, and with great success and ease. A syringe and tube should likewise be within reach, in case it is necessary to wash out the bladder. A female staff and sound is sometimes needed; and a strong lithotrite or crushing forceps, for facilitating the extraction of a large stone.

In all cases having to undergo lithotomy, certain preliminary precautions have to be attended to, which may materially influence a successful issue. Key paid great attention to this point, but Liston was not an advocate of too much preparation. The secretions and excretions, if at fault, should be corrected by appropriate remedies, and the nervous system quieted by anodynes; the urine, especially, should be rendered as healthy as possible, by acids or alkalies, as suits the individual case; sometimes, however, the suffering is so intense that immediate operation is indispensable. It is highly necessary to have an empty rectum; hence it is usual to prescribe a mild purgative powder overnight, to be followed in the morning by an enema of castor-oil, taking care that a free evacuation takes place before operating. Some, as Coulson, prefer giving two enemata, the one to be administered three hours previous to the operation, and to consist of gruel, olive-oil, and salt; the second to be employed about one hour before the time, and to be composed of gruel, with the addition of twenty drops of tincture of opium. The perineum should be shaved if necessary.

The patient is placed upon the table, and chloroform administered; notwithstanding its depreciation by some lithotomists, it materially facilitates the operation, and its effects have not been found in any way to interfere with a successful result.

Four assistants are required besides the administrator of chloroform, viz. one for each side, so as to hold the patient in position, a third to take charge of the staff, and a fourth to assist the operator, in handing the instruments, &c. When under the influence of chloroform, the patient is placed and fixed in the proper position so as to expose the perineum to its fullest extent, and in an entirely perpendicular direction. This is done by flexing the knee and hip joints to such a degree that the patient's hands may be made to grasp the foot, when they are to be firmly secured by a well-adapted figure-of-8 bandage

over hand, foot, and ankle; the knees are
and each held by an assistant, encircling
forearm and hand, and embracing and
wards with the other hand, and thus ste
proper position until the completion of
shoulders and chest have to be raised to
and the patient then to be slided alon
table. Some use a neck ligature, whic
knees and around the neck, but it is at
pensed with. Some surgeons do not tie
use a kind of table with upright props
lower end, which are connected by a tran
the patient's legs are placed, and there m
This table is so made as to suit all ca
leather bracelets, fixed by hooks to firm
been recommended and used. Children n

The patient being now in an accurate
introduces the staff into the bladder: this
same way as an ordinary catheter, whatev
ment may be. Some introduce it before t
as being more easy; but this plan has the
the escape of urine during the subsequent
orifice of the urethra may be narrow, whic
enlargement with a bistoury. The staff sl
large a size as the urethra will permit, bu
size, as it may tear the urethra. It shoul
strike the stone, and left in contact with
exists with stone, the former should be ri
before proceeding to operate. Care must
take the promontory of the sacrum for
We shall now give an account of the ordin
with the curved staff.

A curved staff, of sufficient calibre
between the lateral and convex surfaces, is
bladder, and the end made to rest upon th
trusted to an assistant to maintain *in situ*
by the surgeon from first to last, with in
press the handle as the knife enters the bla
prefer making the convexity of the staff t
neum, so as to be more readily felt; other
it to be hooked against the symphysis,
security. The surgeon's left hand is

throughout the whole operation to guide the knife, guard important parts, &c. &c.

The operator proceeds with the first step of the operation, viz. to lay bare the groove of the staff by an oblique perineal incision; and this of course requires careful previous anatomical knowledge of the neighbouring parts, and the course the knife ought to take to escape important structures, such as the bulb and its artery above, the rectum in the median line, and the internal pudic vessels to the outside. There is the raphé in the median line, succeeded by the anal aperture, and on either side the ramus and tuberosity of the ischium, leaving an intermediate triangular space almost free from danger. The point of commencement is a little to the left of the median line, at a variable distance in front of the anus, and the incision is to be carried obliquely downwards and outwards, midway between the anus and tuber ischii, to the extent of 3 to 3½ inches. Some discrepancy exists as to the exact spot of commencing: thus Cheselden, Keith, and Crichton, all of whom have been remarkably successful, recommend 1 inch in front of the anus; Brodie, Stanley, and Skey, about 1¼ inches in front; Fergusson and others 1¾ inches. All these measurements refer to the adult perineum. The best practical direction is to commence about midway between the anus and scrotum.

The knife is plunged freely into the perineum and carried downwards and outwards, dividing the skin and superficial fascia, as also the transverse perineal muscle and its artery, and some fibres of the levator ani muscle, laying open the perineal triangle and ischio-rectal space. The forefinger of the left hand is then introduced into the wound through the loose cellular tissue to gain the groove of the staff behind the bulb, and just anterior to the resisting deep fascia, when the point of the knife, being slipped along the nail of the finger and thus guided by it, is made to enter the groove at this spot, viz. the membranous portion of the urethra. The left forefinger can also be used to depress and protect the rectum.

The second step is the deeper section, which is effected by carrying the knife along the groove of the staff through the deep fascia, the membranous portion of the urethra, with its muscles, the left lobe of the prostate gland, and a small portion of the neck of the bladder. This is done by maintaining the left forefinger still in the groove, and making perfectly sure that the knife is securely within it; then, by a slight movement

of the right hand, the knife is lateralised so as to correspon
the direction of the external wound, and steadily pushed
wards, until a feeling of loss of resistance or a gush of u
takes place. This is one of the most important parts of
operation, namely, the mode and extent of dividing the pro
gland; and no surgeon should undertake the performan
lateral lithotomy in the adult without a due knowledge of
size, shape, and condition of the organ, and its relation
such vital surrounding structures as the recto-vesical fasci
peritoneum, the great object being to have a sufficient ope
to allow of the passage of the finger, without bruising or
ing the parts. Some surgeons recommend small incisions
subsequent dilatation; others make a free section correspon
to the size of the stone, without regard of exceeding the l
of the gland. Liston is very minute and particular on
point.*

The third step is the introduction of the forceps and
removal of the stone. Now, although the second proceedi
one of the utmost delicacy and moment, the present far e
it in difficulty of execution, and is often the cause of the
and trouble witnessed in lithotomy. The knife having
withdrawn, the left forefinger is carried on along the staff

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* 'This internal incision must be very limited indeed; it should certain
extend beyond six or seven lines from the urethra outwards and down
for the less that is cut the greater will be the patient's safety.' At
(op. cit.) he introduces a sketch 'to show what is indispensable to cut-
a section of the dense, unyielding fibrous tissue at the base and in front
gland into which the muscular fibres are inserted; it appears as a
triangular band, effectually preventing dilatation or enlargement of the
of the bladder beyond a certain and very limited extent, without lac
dreadful suffering, and imminent danger. The incision required to divi
need not pass very far from the groove of the staff; and if that is effect
dilatation can be carried to any required extent. The object in followi
method is to avoid all interference with the reflexion of the ilio-vesical
from the sides of the pelvic cavity over the base of the gland and side
bladder. If this natural boundary betwixt the external and internal
tissue is broken up, there is scarcely a possibility of preventing infiltra
urine, which must almost certainly prove fatal. The prostate and othe
around the neck of the bladder are very elastic and yielding, so that,
much solution of their continuity and without the least laceration, the
can be so dilated as to admit the forefinger readily; through the same
the forceps can be introduced upon this as a guide: and they can
removed, along with a stone of considerable dimensions, say from th
nearly five inches in circumference in one direction, and from four to six
largest.'

the bladder; and on feeling the stone, the sound may be removed; the surgeon now ascertains its position and size, and then proceeds with a suitable pair of forceps to seize and extract the calculus. The forceps are introduced shut, and guided by the finger into the bladder, the handles being gently raised so as to gain the fundus of the bladder, when the blades may be separated, one of which is to be made to slip under the calculus, and the instrument then closed upon the stone. The point is then gently raised, by depressing the handles, so as to bring it towards the external incision, when extraction is to be made in the direction of the axis of the pelvis slowly and deliberately; the instrument is moved forwards and backwards gently, so as to dilate the parts, and these are pushed back, as it were upon the stone, by the finger of the left hand, whilst the extracting force is kept up.

The surgeon may in this stage meet with perplexities. He introduces his forceps through the section he has made and finds no evidence of stone, although the calculus was clearly discovered previous to the operation by its ringing sound and by the evidence of other surgeons. This casualty must be borne in mind and the sources of fallacy considered: viz. 1st, the stone may have been a small one and expelled with the first gush of urine on section of the prostate; the stone may fall out on to the ground, or become driven into the anterior part of the urethra, or have escaped into the rectum, should the latter have been wounded; 2ndly, the stone may be encysted, and hidden in one of the diverticula of the bladder, perhaps entering into the orifice of the ureter; 3rdly, the presence of a tumour at the base of the bladder, behind which the stone has become lodged; 4thly, the section through the prostate not having been completed, so that the forceps, instead of entering the bladder, has passed between it and the rectum.

After the removal of the calculus, the finger must again be introduced into the bladder, so as to ascertain the existence or presence of any other stone; and if the perineum be very deep, a searcher or sound may be passed.

Lateral lithotomy with the straight staff was first introduced by Aston Key at Guy's Hospital, where it is still used by the surgeons. It has its advantages and disadvantages; but upon the whole the straight is as satisfactory an instrument for a guide into the bladder as the curved staff. Of course some little modification in the mode of conducting the operation is required, although the steps are almost precisely the sa in the foregoing operation, viz. to open the perineu urethra, to open the bladder, and to extract the stone.

The operator with the straight staff must bear in mi the first place, that it is more liable to be tilted out bladder than the curved one; hence the surgeon is alway careful to ascertain that the end of the staff rests on the ca previous to his commencing the incision. Again, it is al so easily introduced along the urethra into the bladder the patient is placed in the position for operation; bu difficulty is readily overcome by the practised operator. I the first step of the operation with a straight staff, th generally a twofold or subdivided proceeding, viz. laying the perineum first of all, and then laying open the ur This is necessary with the straight staff, as the membr portion of the urethra is placed at a very great depth, an attempt to enter the urethra early would involve the bu its artery. This is the chief objection to the use of this i ment. Thus, then, in the first incision the integument superficial fascia are cut through, and the knife ma traverse the transversus perinei muscle and fibres of the l ani, giving a good external opening; the next point is t the forefinger of the left hand through the loose cellular in the triangular space until it impinges upon the staff b the bulb, necessitating a much longer track than wit curved staff. The bulb is now protected, and the knife m enter the membranous portion of the urethra; this m thoroughly and unquestionably exposed: a point on whi success of the operation entirely depends.

The surgeon, while maintaining the knife in the gro the staff, withdraws the left forefinger, and now takes cha the staff from the assistant with his left hand; then depr the handle and bringing it parallel with the axis of the p thus presenting a direct passage to the bladder, he lateralise staff and knife simultaneously to the left side of the patie as to correspond to the external incision, and carries the onwards to the bladder, regulating the section of the pr at the same time, or on its withdrawal. Key's knife double convex extremity; hence great caution is requir keep the point upwards in the groove of the staff at an an 45°: for if the staff and knife be held too parallel to each the upper convex border of the latter will be tilted out groove just anterior to the prostate, and instead of entering the bladder, it will pass into the pelvic cavity. The third step consists in laying the knife aside, and transferring the staff to the right hand, so that the left forefinger may be introduced into this wound, and guided by the staff into the bladder, so as to feel the stone, and when satisfied of its presence, maintaining it there *in situ*, while withdrawing the staff. The forceps is now introduced along the finger, and the operation of extraction proceeded with as already detailed.

After the removal of the stone, provided no casualties or difficulties have occurred, some experienced operators recommend the introduction of a gum-elastic tube through the wound into the bladder, where it is to be secured properly by tapes: this is left in, in children, for twenty-four hours; and in adults, for forty-eight hours. Liston says, 'It is especially adapted for the aged;' and he attributes much of his success to its employment, 'as it occasions no inconvenience, and affords great facility for arresting any oozing that may arise from the vessels.' In general, however, it is dispensed with.

The patient is unbound, carried to bed, and laid on his back, with his body raised and his knees bent over a pillow, with the pelvis resting upon a draw-sheet; so that the latter may be drawn away at intervals, as the urine saturates the sheet.

Some surgeons, as Crichton, recommend immediate closure of the wound, in order to gain union by the first intention. Some cases have succeeded well, but others have been followed by severe inflammatory symptoms: hence, as a rule, it is not advisable or justifiable to adopt this measure.

Little or no medical treatment is required, except, perhaps, the exhibition of opium when there is great restlessness; and where the bowels are not relieved within six days a castor-oil enema, carefully given, will be sufficient.

Before adverting to the several varieties of operative measures suggested in lieu of lateral lithotomy, for removing and remedying the defects and difficulties which are encountered in that operation, and for correcting its faults, if there be any, let us carefully survey the several accidents and difficulties, as well as the causes of death, which are generally met with.

With regard to the passing of the staff, great attention and care must be paid to its use in children, as a false passage is readily made, so that the instrument enters the pelvis below the bladder instead of passing into it; and in some rare

instances unusual force has separated the urethra fro
prostate. Hence we are never to operate unless the staff
in contact with the stone. In children prolapse of the r
is also very frequent; the gut must be returned, and the s
ter allowed to contract, before operating. The presence
cicatrix of a former operation need not interfere with a s
or even a third incision in the same situation. On s
occasions at Guy's Hospital lithotomy has been perform
the same patient two or three times along the original s
incision, and without difficulty.* Some recommend fre
cisions to be made on the right side of the perineum, s
there be much induration and rigidity, with fistulous abs
and sinuous tracks; or the surgeon may dilate, if possibl
original opening, cutting along the finger among the a
structures, guided of course by a staff in the urethra. If a
neal hernia exists, it is liable to be cut into; but these cas
exceedingly rare, and the accident is scarcely to be avoide

Enlarged superficial vessels, or the transverse perineal a
may be wounded and bleed, but are readily tied, if neces
with care and due attention the bulb and its artery ough
to be injured (except in cases of very deep perineum), an
accident is mainly due to too great haste and anxiety to
the groove of the staff early: when the bulb or its arter
been wounded, it is best to proceed with the operation
endeavour to secure the bleeding vessel afterwards, by mea
the tenaculum, or compressing forceps: of course if the ha
rhage be violent, the vessel must be secured without delay

During the second step, several serious accidents may a
for if the knife be carried too much outwards, under the r
of the pubes, the pudic artery may be wounded; or if ca
too much inwards, with a full rectum and prolapsus o
organ, that tube may be involved; and lastly, which is b
the most important point, there may be too great or too
section of the prostate gland, and wound of the prostatic p
of veins. In wounds of the internal pudic artery, it is be
request an assistant to compress the artery against the p
and to complete the operation of extraction, when the a
may be attempted to be secured by ligature; should this f
short gum catheter, around which some oil-silk is fixed, li

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* On this subject see *infra* the table of cases of relapse of stone occurr
the Norfolk and Norwich Hospital, with remarks by Mr. C. Williams, pp.
1068.

an umbrella, is to be introduced into the wound, and the space between it and the catheter plugged with lint, cotton, or charpie; this is the *canule à chemise* of Dupuytren. Sometimes there is an unusual distribution of vessels: but the case must be treated in the same manner. Where there is general oozing and venous hæmorrhage, cold water and ice to the perineum and above the pubes are useful.

The wounding of the rectum has occurred to some of our best operators, during the struggling of the patient, when chloroform was not in vogue; sloughing of the rectum from bruise and injury during the extraction of a large stone has also taken place. The urine will flow in part by the rectum, and a natural cure cannot readily take place. The earlier the sphincter is divided, as for the cure of complete fistula in ano, the better will be the patient's chance of being freed from an annoyance.

With regard to the section of the prostate gland, much weight is attached to the amount of its division in adults; whereas in infants and young children there is no such fear, as the gland is but rudimentary. Sir H. Thompson (op. cit.) remarks, that 'the prostate is so exceedingly small as to be almost always, if not invariably, cut wholly through in lateral lithotomy, yet without the occurrence of any accident. Indeed, it is not possible that either forceps or finger can pass into the bladder unless the incision exceeds the thickness of the organ.' Again, in children a difficulty may arise from the staff having escaped from the urethra by a false passage, so that the knife cannot be guided into the bladder; or the urethra may be separated from the prostate; or again, the bladder may recede before the point of the knife: in the two former cases the staff must be partially withdrawn and manipulated, so as to reach the bladder by the natural passage, and a grooved director introduced through the wound may sometimes be passed. When the bladder recedes before the knife, so that the finger cannot be made to enter the viscus, Liston suggests the use of a searcher, whereby he would pull the opening of the bladder, as it were, down upon the finger; should, however, it be possible to introduce the bent first joint of the finger, the bladder can be pulled down and the stone felt. In the adult, the section should never exceed the external limits of the prostate; this has already been alluded to. Sometimes the patient is remarkably corpulent, and has a deep fatty perineum, and probably also an enlarged and rigid

prostate and a receding bladd
be traversed, so that there is
opening freely, and the finger
in such cases, a probe-pointed
plete the section,—a lithotom
most judicious proceeding is t
carefully directed onwards to
escape from the staff: in fact
and is sometimes now, emplo
lateral operation. A hypertr
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pelvis. Martineau used the
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cision with the blade of the b
drawing the stone from the
operation, the gland is not br
duction of the gorget separa
enlarges the incision as far as
it; for the fascia yields and st
bladder. Sudden violence in t
is nearly as much to be depre
the stone. The kind of viole
perly employed, inflicts, is
symptoms of high inflammatio

Respecting the difficulties e
stone, they are almost innume
to circumstances: a few of th
cases of large calculi, Listo
single lateral incision affords s
stone in nineteen cases out o
purpose served, therefore, in al
of the gland, and thus endan
individual.' He again, howeve
sible to bring it through an op
such as described, without bru
it will then be proper to provid
this is gained by making the in
neck of the bladder. This is d
and blunt-pointed bistoury alo
edge towards the right tube
external incision has been well

sufficient extent and low in the perineum, there is no occasion for any further division of the skin and superficial parts. No complicated machine is required to make this bilateral division, and it is quite time enough to have recourse to the proceeding when the necessity has been fully ascertained to exist.'

Martineau* remarks, that 'should the stone be large, or there be any difficulty in the extraction, rather than use much force while the forceps have firm hold of the stone, I give the handle to an assistant . . . . while the part forming the stricture is cut, which is easily done, as the broad part of the blade becomes a director to the knife; and rather than lacerate, I have often repeated this enlargement of the inner wound two or three times.' Some surgeons, more especially recently, have recommended the crushing and breaking up of a large calculus by a lithotrite, or strong crushing forceps, or cutting it in two by appropriate instruments, and then extracting. This has been performed successfully; but great danger and risk is necessarily incurred, for the bladder is generally firmly contracted on the stone, so that the coats and mucous membrane can hardly escape injury. Where it is so large, and the above measures fail, recourse must be had to the recto-vesical or supra-pubic operation. Where the stone is soft and friable, or brittle, crumbling to pieces under the application of the forceps, much of it may be removed therewith, and the rest evacuated by the scoop. The washing out of the bladder with warm water, by means of a syringe and tube, is highly useful, and attended with excellent results, in detaching any débris or concretion from the walls of the bladder without injury.

When the calculus assumes an elongated form, or any unusual shape, careful manipulation with the finger and forceps may shift it into such a favourable position as to allow of its extraction. Where there is much spasm of the bladder, and a kind of hour-glass contraction, it is best to wait a few moments until it has subsided, and then carefully coax the forceps between the calculus and the walls, gentleness and patience being the chief treatment. Sometimes a stone is caught in the upper part of the bladder, and can almost be felt above the pelvis; by gentle pressure in the hypogastric region, it may be made to descend so as to be seized with the forceps. Encysted calculi often give an infinite deal of trouble, and sometimes will defy

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* *Med.-Chir. Trans.* vol. ii. p. 411.

all efforts at extraction. In extracting phosphatic calc
operator must be on his guard, and recollect that sometin
careous matter is firmly deposited on the mucous membra
any attempt to remove it by the forceps will only tea
the tissue with it. Another point, which is alluded
Sir H. Thompson, is, that sometimes in elderly patients p
of the prostate gland have been removed by laceration,
the small rounded tumours in the substance of the org
the pedunculated growths met with in this situation.

The extraction of the stone is attended with more ha
the gland. In this step of the operation, time must b
for the parts that embrace the stone to dilate; the m
structure at the neck of the bladder, the firm substanc
prostate gland, and the deep fascia, will each stretch a
to the sustained efforts of a firm but gentle hand. Th
is sometimes injured in withdrawing the stone, by the
embracing a portion of it, and tearing it away from th
This may be avoided by passing the finger below the forc
disengaging the gland from the forceps after the stone is

A nervous or a violent operator, feeling some resistan
efforts at extraction, redoubles them, until he finds the stor
ing the force that he employs; and the operator, in ig
of what he is doing, drags the gland before the stone, se
it from its attachment to the deep fascia, and brings it n
the external aperture before his efforts succeed. The
quence of such an injurious proceeding is to bruise the g
cause it to slough, and to render infiltration of urine
inevitable, by the laceration of the deep prostatic connec

Before proceeding to the question of mortality after
lithotomy, we will just allude to the complications whi
ensue, although the patient has made a good recovery
the wound may not entirely close, and leave a urinary
which must be treated as other urinary fistulæ; incon
of urine may result, either temporary or permanent. Th
very common: it is mostly met with in children, and may b
by attention to the passing of the urine and the general
as age advances, it generally passes off. Key* remarks, t
the young subject partial incontinence will sometimes o
the patient is allowed to leave his bed too soon after the
tion, before the neck of the bladder is firmly healed a

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* *Guy's Hospital Reports,* vol. ii. p. 25.

sphincter has recovered its tone.' Impotency, from injury done to the ducts and vesiculæ seminales, is very rare, and is irremediable. Fæcal fistula sometimes follows, either from the effects of the knife, or from the sloughing consequent upon bruising of the rectum during the extraction of the stone.

The causes of death after lateral lithotomy are the following:

1. Death from the shock of the operation, without any discoverable lesion, may occur, as in any of the ordinary operations; it is very unfrequent, generally occurring in old people, and sometimes in children; it seems to depend upon some peculiar condition of constitution and nervous system.

2. Death from chloroform may likewise occur, and the same remarks as just made about shock apply to these cases. Lithotomy in nowise militates against the use of anæsthetics.

3. Death from hæmorrhage and exhaustion may ensue, either primarily immediately after the operation, or secondarily some days after, from separation of the plug of coagulum in the wounded vessel, or separation of a slough from a bruised vessel, or the extension of a sloughing wound involving the vessels. Death from primary hæmorrhage rarely occurs, and although children can little stand any great amount of loss of blood, yet we sometimes see them rally after having been thoroughly blanched and in an apparently hopeless condition. Liston states that the average is about 1 death in 100 cases of death; M. Begin affirms that hæmorrhage is the cause of death in 1 out of every 4 deaths; but this is not so in this country. Although primary and secondary hæmorrhage may not *per se* cause death, yet it will so act as to cause great constitutional depression and debility, and consequently prevent the reparative process, and lay the foundation for general decline, or place the patient in a condition favourable for pyæmia.

4. Death from pelvic cellulitis is by far the most frequent in adults. It consists in an acute inflammation of the tissues around the outside of the bladder, more especially the neck, base, and sides; and is generally produced by urinary infiltration into the cellular tissue of the pelvis. Some consider it to be due to too great a section of the prostate, involving the deep pelvic fascia, and allowing the urine to pass directly into the cellular tissue, and thus cause the inflammation; others maintain that the infiltration of the urine is not a mechanical process, but generally follows inflammatory action, and that this inflammation is due to mechanical violence inflicted in removal of the

stone from insufficient sectio
death has taken place fro
urinary extravasation. Thi
tiguity to the peritoneum, i
leads to purulent infiltration
symptoms are those of sever
with rigors, great prostratio
symptoms of low typhoid f
healthy aspect, and giving e

5. Death from acute perit
ring in adults, but now and th
position of the bladder is cl
large a section of the neck a
it. Peritonitis used form
frequent cause of death aft
tigations have disproved thi

6. Death from acute infla
of the bladder (cystitis), ext
is also rare, although Boyer
three-fourths of the deaths;

7. Death from inflammati
and its effects is not unfrequ
of advanced life; the disease
week or a fortnight, when r

8. Death from pyelitis, c
suppuration of the kidney, h
and at the post-mortem exa
disease has given evidence
the operation.

9. Death may also occur fi
the urine, thus poisoning th

Erysipelas, diarrhœa, feve
may render the operation fa

Many statistical inquiries have b
lateral operation of lithotomy. Th
South, Coulson, and others, to who
anxious to investigate the subject.
be relied upon as offering any direct
in estimating the value of the opera
and returns, in which are many fau
been alluded to by Sir Henry Thor
before the profession a more corre
tolerably complete epitome of the m

it is derived from reliable sources, mentioned in the text of his work, and contains 1,827 cases.

Mortality rates at all ages in 1,827 *cases of lateral operation, in metropolitan and provincial hospitals.*

	Cases.	Deaths.	Cases.
Norwich (Crosse)	669	91	about 1 in 7⅓
Since that time	124	15	„ 1 in 8¼
Oxford	110	14	„ 1 in 8
Leicester	90	8	„ 1 in 11
Leeds	29	4	„ 1 in 7¼
Birmingham	102	10	„ 1 in 10
Guy's Hospital	230	33	„ 1 in 7
St. Thomas's Hospital	200	29	„ 1 in 7
University College Hospital	90	12	„ 1 in 7½
Cambridge	183	13	„ 1 in 14
	1827	229	nearly 1 in 8

Some have based the rate of mortality on the weight of the stone (see Crosse), id have drawn a conclusion that the mortality increases in nearly the same tio as the weight.

Others, and perhaps with more reason and practical tendency, have conlered the mortality in proportion to the different ages of the patients. This so has been done by Sir H. Thompson in the following table. Still even this ethod is open to objection, inasmuch as a stone may have been formed in the adder and have remained there a long time previous to the operation.

Mortality rates at different ages.

During the years	Cases.	Deaths.	Cases.
to 5 inclusive	473	33	or about 1 in 14⅓
to 11 „	377	16	„ 1 in 23½
to 16 „	178	19	„ 1 in 9½
to 20 „	76	11	„ 1 in 7
to 29 „	86	11	„ 1 in 8
to 38 „	75	7	„ 1 in 10½
to 48 „	100	17	„ 1 in 6
to 58 „	191	40	„ 1 in 4¾
to 70 „	233	63	„ 1 in 3¾
to 81 „	38	12	„ 1 in 3⅙
	1827	229	

We have taken the liberty to made a slight modification of the above, so as, ossible, to show the mortality at the different epochs of life, which may de us in some measure; but it is somewhat arbitrary:

Mortality rates

1 to 5, infancy and childhood, 47
33 deaths, about 1 in 14½ cases
6 to 11, boyhood, 377 cases, 16
about 1 in 23½ . . .
12 to 16, boyhood, with increasin
velopment and setting-in of pul
17 to 29, adolescence and manhood
30 to 48, adults . . .
49 to 70, advancing life . .
71 to 81, advanced life . .

We have here inserted a table d
cases operated on at the Norfolk
ninety-eight years, from January 1

[See Table on page 1063.

970 were male patients, o
lateral lithotomy, with a n
operation, of whom 13 died
cases, with a loss of 3; and
died. The total number
operation was performed f
amounts to 1,015, which g
cases per year. The tota
actual number of patients s
Institution during the 97 ye
upon. During that perio
presented themselves, some
operation; others were foun
portant organs—a conditi
recovery, had any operat
Hospital Reports for the
cases of stone were admitte

The lateral method hav
number of patients as 871,
number from the above tabl
tion at the different epochs
form.

[See Table on page 1064.]

TABLE CONTAINING AN ANALYSIS OF ALL CASES OF STONE IN THE BLADDER OPERATED ON AT THE NORFOLK AND NORWICH HOSPITAL DURING A PERIOD OF NINETY-SEVEN YEARS, ENDING DECEMBER 1869.

Compiled by Mr. CHARLES WILLIAMS, Assistant Surgeon to the Hospital.

Age of cases operated upon.	No. of operations.	Recoveries.	Deaths.	Per centage fatal.	Proportion fatal.	No. of operations.	Recoveries.	Deaths.	Per centage fatal.	Proportion fatal.	No. of operations.	Recoveries.	Deaths.	Per centage fatal.	Proportion fatal.
1 to 5	206	189	17	8·25	1 in 12·11	364	342	22	6·04	1 in 16·54	623	578	45	7·22	1 in 13·84
5 „ 10	158	153	5	3·16	1 „ 31·6										
10 „ 15	81	74	7	8·64	1 „ 11·57	127	114	13	10·23	1 „ 9·76					
15 „ 20	46	40	6	13·04	1 „ 7·6										
20 „ 30	64	59	5	7·81	1 „ 12·8	132	122	10	7·57	1 „ 13·2					
30 „ 40	68	63	5	7·35	1 „ 13·6										
40 „ 50	65	51	14	21·53	1 „ 4·64	206	167	39	18·93	1 „ 5·28	392	305	87	22·19	1 „ 4·5
50 „ 60	141	116	25	17·73	1 „ 5·64										
60 „ 70	154	116	38	24·67	1 „ 4·05	186	138	48	25·80	1 „ 3·83					
70 „ 80	32	22	10	31·25	1 „ 3·2										
Total	1015	883	132	13	1 in 7·68	1015	883	132	13	1 in 7·68	1015	883	132	13	1 in 7·68

TABLE OF CASES ON WHOM LATERAL LITHOTOMY WAS PERFORMED AT THE NORFOLK AND NORWICH HOSPITAL FROM JANUARY, 1772, TO DECEMBER, 1869 (A PERIOD OF 97 YEARS).

Compiled by Mr. CHARLES WILLIAMS, Assistant Surgeon to the Hospital.

Age of patients operated upon.	No. of cases.	Per centage of the whole number.	Recoveries.	Per centage of recoveries.	Deaths.	Per centage fatal.	Proportion fatal.	No. of cases.	Per centage of the whole number.	Recoveries.	Per centage of recoveries.	Deaths.	Per centage fatal.	Proportion fatal.	No. of cases.	Per centage of the whole number.	Recoveries.	Per centage of recoveries.	Deaths.	Per centage fatal.	Proportion fatal.
1 to 5	185	21·23	169	91·36	16	8·64	1 in 11·56	335	38·46	314	93·74	21	6·26	1 in 15·95	551	63·26	507	92·02	44	7·98	1 in 12·52
5 ,, 10	150	17·22	145	96·6	5	3·4	1 ,, 30														
10 ,, 15	73	8·38	66	90·41	7	9·59	1 ,, 10·42	113	12·97	100	88·50	13	11·50	1 ,, 8·69							
15 ,, 20	40	4·59	34	85	6	15	1 ,, 6·6														
20 ,, 30	51	5·85	46	90·20	5	9·80	1 ,, 10·2														

TABLE OF CASES ON WHOM LITHOTOMY WAS PERFORMED A SECOND TIME AT THE NORWICH HOSPITAL. THE TABLE IS INTENDED TO SHOW THE AGE IN *YEARS* OF EACH PATIENT AT THE TIME OF HIS BEING FIRST OPERATED ON; THE INTERVAL IN *MONTHS* BETWEEN THE FIRST AND SECOND OPERATION; THE WEIGHT OF THE CALCULI REMOVED; THE RESULT; AND SOME OBSERVATIONS ON THE GENERAL CHARACTER OF THE CALCULI.

By Mr. CHARLES WILLIAMS, Assistant Surgeon, Norfolk and Norwich Hospital.

No.	Age at 1st operation.	Interval between 1st and 2nd operation.	Weight of calculi.		Result.	OBSERVATIONS.
			1st operation.	2nd operation.		
1	2½	15 months	℈ijss	ʒj	Cured	The first calculus phosphatic, and broken in the extraction; the second likewise phosphatic, and broken.
2	3	14 "	6 grs.	ʒiijss	"	One small oxalate of lime removed entire at first operation, and a mixed one at the second.
3	3½	24 "	ʒijss	ʒij ℈ij	"	The first calculus was entire and phosphatic; the second likewise phosphatic and unbroken.
4	7	24 "	ʒjss	℈ij	"	A perfect oxalate of lime stone taken away on first occasion; a phosphatic one on second.
5	8	17 "	℈vij	ʒivss	"	One entire lithic-acid calculus removed at the first operation, which left a recto-vesical fistula; the second was an entire phosphatic calculus.
6	15	16 "	iij	ʒj	"	Three broken phosphatic calculi extracted at first; on the second occasion the calculus was of the same description.
7	18	8 "	ʒvj	ʒivss	"	One phosphatic calculus, broken into four fragments, taken away at first; and one of the same composition at the second operation.
8	24	24 "	ʒxvj	ʒvj	"	A broken phosphatic stone removed on the first, and the same on the second occasion.
9	31	22 "	ʒj	℈xj	"	First calculus (a mixed one) perfect; an encysted stone left undiscovered, which was removed at the second operation (median), together with one lying loose in the bladder.
10	33	104 "	ʒxvj	ʒix	"	A single calculus of considerable size, consisting of alternate layers of dried blood and calculous material which broke down on extraction, was removed at the first operation; a broken phosphatic one at the second Lateral lithotomy performed on first and median on second occasion.
11	37	46 "	ʒv	ʒiijss	"	One perfect phosphatic calculus at first operation; also one of the same composition at the second.
12	48	12 "	ʒiij	ʒv	"	One flat lithic-acid calculus first removed entire; the stone removed at the second operation was of the same consistence.
13	60	34 "	ʒviij	ʒiv	"	Four entire uric-acid calculi removed on the first occasion, and one of the same material on the second.

(Table continued from preceding page.)

No.	Age at 1st operation.	Interval between 1st and 2nd operation	Weight of calculi.		Result.	Observations.
			1st operation.	2nd operation.		
14	61	30 months	ʒiv	℈v	Cured	This man had undergone lithotrity twice previously to the first lithotomy, at an interval of twenty-eight months; an interval of thirteen months existed between the last lithotrity and the first lithotomy. The débris after lithotrity consisted principally of uric acid and phosphates; several phosphatic calculi, many of them broken, were removed at the first lithotomy, as well as at the second; a perineal fistula remained after the former operation; median lithotomy adopted on latter occasion.
15	63	32 „	℥iv	℥iij	„	One entire lithic-acid stone at the first and the same at the second operation; had stone a *third time*, but was deemed unfit for operation.
16	66	4 „	℈j	℈viij	„	A broken lithic-acid stone at the first operation, and five capped with phosphates at the second; median lithotomy resorted to in both instances; a perineal fistula resulted from the first, which was cured by the second operation.
17	68	7 „	℈viij	℈vj	„	Five entire and two broken uric-acid calculi came away at the first operation, and two perfect uric-acid at the second, on which occasion median lithotomy was performed.
18	71	28 „	℥ixss	ʒxij		Three unbroken uric-acid calculi were removed on the first occasion, and one large phosphatic one

Cases on whom Lithotomy was performed a third time.

No.	Age at 1st operation.	Interval between		Weight of Calculi.			Result.	Observations.
		1st and 2nd operation	2nd and 3rd operation.	1st operation.	2nd operation.	3rd operation.		
24	7	16 months	11 months	ʒij	℈x	ʒiv	Cured	Two entire lithic-acid calculi were removed at the first operation; a phosphatic one at the second, and a perfect oblong phosphatic one at the third. The lateral operation adopted on each occasion.
25	57	78 „	11 „	ʒxijss	℈ij	ʒij	„	Five unbroken uric-acid stones at first operation; one phosphatic and broken at the second, and a single calculus of phosphates and urates removed entire at the third operation, which was lateral; the two former were median.
26	59	58 „	15⅛ „	ʒij	℈v	ʒij gr. xv	„	One entire lithic-acid stone at first operation, and one of the same composition at each subsequent operation. The lateral resorted to on each occasion.
27	69	9 „	34 „	℈viij	℈ijss	ʒi	„	At the first operation several small phosphatic stones were taken away; a perineal fistula present at the second and third operations, which were performed according to the median plan; soft phosphatic calculi removed on both occasions. This patient had been lithotomised ten years before his first operation at the hospital, by Mr. C. M. Gibson, of Norwich; he had therefore been operated on *four* times, twice by the lateral method and twice by the median. He lived four years after the last operation.

Remarks by

This table presents 27 cases
was performed a second time
in four. The proportion tha
number—1015—is one to 37·

Twenty-two were cured;
time, four were cut and recov
operation; all the patients we
having shown itself in the fe

Six of the cases were below
and 20; one between 20 and
between 40 and 50; three be
60 and 70; and seven betwee
below 40 years of age, and fo
former (38 years of age), die
unrecorded; of the latter, on
cause unknown; the second, a
unknown; the third, aged 7
day, and the fourth case als
day.

The second operation took
from the date of dismissal
two years; in four within th
years; in two within nine yea

In four cases lithotomy w
of these patients, at the exp
missal; in one, fifteen mont
months.

The lateral operation was
three times in two cases. T
in one patient, and twice in
stances the lateral preceded
twice by the median plan,
lateral, and twice by the m
formed in all the cases along
and without difficulty.

In 18, the calculi were

---

* One patient had been operated o
by the median.

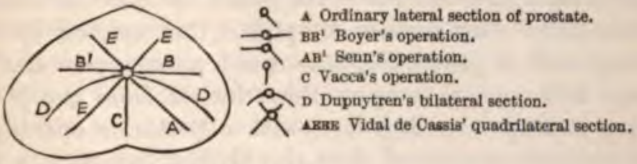
in seven they were broken previously to extraction; in two instances, where the stones were small and numerous, some were removed in a broken state, and others were perfect; in one case, a sacculated calculus was left undetected in the bladder (Case 9).

It does not appear that the calculus removed at the second operation is necessarily of the same character, in all cases, as that removed at the first; in 18 the second formation was of the same composition as the first, nine being composed of the phosphates, and nine of lithic acid and lithates; the phosphates succeeded the lithates in seven, and the oxalates in two.

Such are the practical points in connection with ordinary lateral lithotomy; we shall now cursorily allude to the several other modes of proceeding in the perineal section, as adopted in this country and elsewhere.

1. Lateral lithotomy modified as regards the section of the prostate:—

FIG. 306.


E
E
B'
B
D
D
E
C
A
A Ordinary lateral section of prostate.
BB' Boyer's operation.
AB' Senn's operation.
C Vacca's operation.
D Dupuytren's bilateral section.
AEEE Vidal de Cassis' quadrilateral section.

Vertical section of prostate, showing the various incisions recommended.

Boyer made a transverse incision of the prostate with the lithotome caché, dividing the gland in its greatest diameter (see Fig. 306, BB'); but the objection to the operation was the division of the perineal vessels, and consequent hæmorrhage. Senn combined the two, by making the ordinary oblique incision through the left lobe, and the transverse one through the right (see Fig. 306, AB').

2. The perineal incision, made in a transverse direction and of a semilunar curve in front of the anus. This was advocated by Dupuytren in his well-known bilateral section of the prostate gland in cases of large stone. He divided the tissues owards the symphysis, so as to avoid the rectum; the urethra was opened from above downwards (median) with a double-edged bistoury, and then his curved double lithotome was ntroduced into the bladder; the blades were then opened and

made to cut their way out, d
diameters (see Fig. 306, DI
gave 19 deaths in 85 cases, (

3. *Median lithotomy*, wher
line of the perineum, former
This comprises two modes
the prostate gland, or witho
opening the urethra, with p
of the apex of the organ.
median operation, and he
prostate; but, although the
rectum was endangered, so
performed when the stone
(see Fig. 306, c).

Civiale in 1836 modified t
operation. Having made h
line, he avoided the bulb, an
of the urethra, when he in
lithotome into the bladder
made a transverse section of

Buchanan* has further
lowing mode of proceeding:
is one bent at right angles
having a deep lateral groov
instrument is introduced int
forefinger in the rectum, and
in situation with the apex o
grooved branch lying parall
on the farthest extremity o
urethra, so that when the k
the staff the membranous po
is intrusted to an assistant,
forefinger in the rectum, tak
it in his right hand with the
and the edge directed to the
opposite the angle of the st
into and along the groove, a
into the bladder. Next he
making a lateral section of t
outwards and downwards, a

---

* *Edin. Monthl*

about one-fourth of a circle round the upper and left side of the rectum, in which organ his finger still remains: an external wound surrounding the corresponding part of the anus about 1¼ inches in length results from the operation. His arguments in favour of this procedure are: 1. the more easy and rapid method of reaching the prostate gland, being only two lines from the surface of the skin, the rectum pressed out of the way and the knife passed straight forwards into the bladder; 2. the membranous portion of the urethra is avoided and less incision required; 3. all blood-vessels are out of the way, and consequently there is no hæmorrhage; 4. the rectum, notwithstanding its vicinity to the incision, is less likely to be injured; and 5. there is less risk of deep-seated infiltration of urine.

Allarton's* operation is also performed in the median line, but he does not make any section of the prostate gland, except it be but partial, just incising the apex. The ordinary staff is introduced into the bladder, and then the left forefinger passed into the rectum, so as to feel the staff at the prostate: he transfixes with a straight bistoury the perineum in the median line about half an inch above the anus, carrying the knife on till it strikes the groove of the staff at the membranous portion in front of the prostate; the urethra is pierced at this spot, and after pushing the knife towards the bladder for a few lines, it is withdrawn, at the same time cutting upwards, dividing the urethra a little, and finishing so as to have an external incision of ¾ to 1½ inches. A long ball-pointed probe is then passed into the bladder along the groove of the staff, when the latter is withdrawn, and the left index-finger slided along the probe into the bladder, dilating the prostate and neck of the bladder to the requisite extent, and serving as a guide to the forceps. Where the stone is large he uses Weiss's three-bladed female dilator, or Arnott's hydraulic dilator.

In cases of large stone Vidal de Cassis has advised a quadrilateral section of the prostate gland; he says, 'no matter what kind of external incision, as long as it is not too small, whether it be transverse, oblique, vertical, or curved: the point in view is to have one large external incision and many small internal ones. The two first sections of the prostate are to be made along the two inferior oblique diameters of the gland, which will be sufficient when the stone is of moderate size; but when

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* *On Median Lithotomy.*

large, the two superior obl
one and then the other' (s

We shall now pass on t
recto-vesical operation. T
sequence of its supposed re
passage of instruments, be
The operation consists in
position as for ordinary li
then introduced into the
firmly and perpendicularly,
line. The operator takes a
the right hand, resting t
surface of the left forefing
into the rectum to the exter
hand the edge of the knif
thrust through the anterior
groove of the staff, and as th
the rectum, the external sp
the urethra and integument
one inch. The left forefing
the sphincter, and the nail
when the bistoury, with its
through the wall of the ure
the direction corresponding
the bladder and the prostate
to the presumed size of th
moved, the finger is introdu
lus extracted by the forceps.

The drawbacks to the ope
membrane of the rectum
wounding the peritoneum
quent occurrence of urinar
into the bladder, fistulous si

Recto-Vesical Lithotomy
vogue with the Italian su
Cavarra and others; it was
Sanson, Dupuytren, &c.
been occasionally had recou
operation generally discarde
erased the operation and
recent edition of Operative

statistics of this operation is that given by König,* which we have modified and appended.

Ages.	Cases.	Cures.	Recoveries with fistula.	Deaths.	Proportion of deaths.
Under 5 years	12	8	1	3	1 in 5
From 5 to under 10	13	9	2	2	
,, 10 ,, 20	16	13	1	2	1 ,, 8
,, 20 ,, 30	5	3	1	1	1 ,, 5
,, 30 ,, 40	5	4	—	1	1 ,, 5
,, 40 ,, 50	3	2	—	1	1 ,, 3
,, 50 ,, 60	9	4	2	3	1 ,, 3
,, 60 ,, 70	6	6	—	—	— —
,, 70 and over	9	4	2	3	1 ,, 3
Age not stated	5	3	2		
	83	56	11	16	1 ,, $5\frac{3}{16}$

The hypogastric or high operation.—Epicystotomia is considered by some surgeons the most direct, short, and least dangerous operation. Its advocates argue that there are no technical or anatomical difficulties, with the exception of the peritoneum, which is easily avoided. It suits all sizes of stone, enables the surgeon to have a free opening into the bladder, and there is not so much danger of infiltration of urine as has been alleged. The wounding of the peritoneum must be regarded as a failure in anatomical manipulation. Pitha remarks, that in male children and young persons below 20, as well as in females, the bladder stands high above the pubes, and presents an uncovered portion freely to surgical manipulation; under 8 years the peritoneal reflection from the bladder does not generally reach lower than 1½ to 2 inches from the navel. In old persons, especially when emaciated, the bladder lies deep in the pelvis, behind the symphysis, and is difficult to reach; hence the impropriety of operating by this method in such cases.

Other surgeons maintain that there is great risk of peritonitis, infiltration of urine, and wound of the peritoneum, and that the operation is only applicable in cases of deformed pelvis; and where there is much fat it is rendered very difficult.

The old method was that of Franco, who introduced a finger into the rectum and pushed the stone up towards the hypogastrium, and its prominence formed the guide for the incision. A more cautious proceeding was afterwards adopted. The preparation for the operation consists in emptying the rectum

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* König: *Journ. der Chirurg. von Graefe* u. *Walther*, Bd. viii. p. 529, 1825.

and distending the bladder,
urine or by injecting a suffi
duce distension without o
formed under chloroform a

The patient is placed on
the operation is performed
laying bare the anterior wal
in the median line immedia
the linea alba and fascia t
subfascial cellular tissue, in

The second step is that
most important part of th
precision and care; the op
symphysis, and quite in the
suggested and used an in
which consists of a trocar
introduced through the ure
trocar is extruded and push
at the external opening.
and mischievous. It is bes
wound, and thus secure it.
median incision from below
a transverse incision. The
must be kept open by retra
of the parietes to contractio

The third step consists in
may be readily done by a p

Civiale uses the sonde-à-d
operation.*

The after-treatment is
formerly a gum catheter w
counter-opening in the pe
some used sutures in the bl
judicious to place the patie
the legs drawn up, to empl
No catheter, no canula, no

Vidal recommends the
temps.' An incision is to
all the tissues and exposin
to be set aside, and the wou

---

* See Tho

replaced daily, so as to prevent union. If at the end of six, seven, or eight days there be abundant suppuration, the operation is to be completed by opening the bladder with a straight bistoury, and extracting the calculus.

Supra-pubic lithotomy had at one time many advocates, and it is now strongly urged in those cases where there is a very deep perineum, with enlarged prostate, and a large-sized calculus. The most comprehensive work on the subject is that by M. Belmas,* whose carefully collected table of 100 cases will give some general idea as to the success of the operation.

Ages.	Cases.	Recoveries.	Deaths.	Proportion of deaths.
Under 5 years	9	8	1	1 in 25 cases
From 5 to under 10	16	16	0	
,, 10 ,, 20	15	13	2	1 ,, $7\frac{1}{2}$,,
,, 20 ,, 30	9	8	1	1 ,, 9 ,,
,, 30 ,, 40	7	4	3	1 ,, $1\frac{1}{4}$,,
,, 40 ,, 50	7	6	1	1 ,, 7 ,,
,, 50 ,, 60	7	4	3	1 ,, $2\frac{1}{3}$,,
,, 60 ,, 70	16	6	10	1 ,, $1\frac{3}{5}$,,
,, 70 and upwards	14	10	4	1 ,, $3\frac{1}{2}$,,
	100	75	25	1 ,, 4 ,,

CIVIALE† gives a very unfavourable account of this operation as performed in Paris, for of 75 cases, 35 died, and 35 recovered, and of these latter 5 had a fistula remaining. In 5 cases the result is not given. *Gross*‡ has constructed a table of 180 cases, but it is probable that many of the cases of one collector is included in that of another. However, we have thought fit to offer the table as it stands in his work.

TABLE SHOWING RESULTS OF 180 CASES OF THE SUPRA-PUBIC OPERATION.

Operative collectors.	Cases.	Cures.	Deaths.	Proportions.
Frère Côme	100	81	19	1 in $5\frac{5}{19}$
Douglas	4	3	1	1 ,, 4
Cheselden	9	8	1	1 ,, 9
Paul	4	4	0	
Pye	4	1	3	3 ,, 4
Malgill	4	3	1	1 ,, 4
Thornhill	16	13	3	1 ,, $5\frac{1}{3}$
Louberbeille	39	28	11	1 ,, $3\frac{6}{11}$
	180	141	39	1 ,, $4\frac{8}{13}$

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* Belmas: *Traité de la Cystotomie sus-pubienne.* Paris, 1827.

† Civiale: *Parallèle entre la Cystotomie, etc.* Paris, 1836.

‡ Gross: *Diseases of the Urinary Bladder,* 1855, p. 636.

Dr. Humphry* of Cambrid
14, where the stone was of
egg, and weighed 1⅓ ounce.
derived from the foregoing o

'In the 104 cases tabulat
than 1 in 3. The age of th
in the result, for—

In 38 cases under 20 years .
„ 8 „ between 20 to 50 y
„ 19 „ from 50 to 70 year
„ 18 „ above 70 years .
83

'The cause of death appea
or infiltration of urine int
the bladder.

'*Maund* is said to have lo
100 patients operated on by
reported to have died. The
have been unwilling to admi

In taking a general surve
son of the various principal
calculus from the bladder, m
condition of the patient, as
stone. In the first place, th
whether the case be fit for
subject, however, is alluded
When lithotomy is determin
a moment that in children
operation is the safest and m
1 in 17½ cases only. Of cou
formance of the median oper
even of moderate size. At pu
hood and adults, from 12 to 4
operation rises to nearly 1 i
amounts to 1 in 4 cases. It is
some other modes of operatin
mortality. Statistics have n
as might be anticipated. Th
on 139 cases at all ages, 13 d
when restricting this to adul

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* *Trans. of Prov. Med. and Surg.*

in Mr. Williams's report the mortality over 50 years of age is nearly 1 in 2½. Of 60 cases operated upon by Buchanan's method, the result seems to be the same as in Allarton's operation, except that in adults the mortality is 1 in 8.

The bilateral operation of Dupuytren bears a death-ratio of 1 in 4½, the recto-vesical about 1 in 5, and the supra-pubic 1 in 3½. These latter proceedings are only had recourse to in cases of very large stone and where complications exist preventing perineal lithotomy.

As far as our present information extends, the median operation may be performed with safety in cases where the stone is small; but the lateral operation is to be preferred in all other cases where lithotrity is inexpedient.

The main issue, as regards the success of any one form of operation, seems, after all, to be chiefly dependent upon the mode of enlarging the opening of the urethra through the prostate and the neck of the bladder. This resolves itself into one of two proceedings; either dilatation of the prostate and neck of the bladder, as in the median operation, or section of these structures, as in lateral lithotomy. Is it safer to dilate, bruise, and lacerate the prostate gland and neck of the bladder, or to make a clean, careful incision with the knife? Small stones are no test whatever as to the value of either mode of operation, nor are calculi in children; for in the latter, whichever mode is adopted, a recovery is expected.* It is in adults that we are always trying to lessen the mortality after the lateral operation, and none of the recent improvements seem to have supplied the deficiency. Even in Mr. Allarton's recent table, p. 499, 2d edit., his mortality is 1 in 7.

We should have gladly quoted the table inserted in that work, which consists of 170 cases of median lithotomy, but these do not in the least represent the actual state of affairs; the cases are for the most part taken from all sorts of reports of a successful issue; many known cases of death after the median operation are unrecorded; in two instances the author himself has been obliged, in consequence of the size of the stone, to abandon the operation, and terminate it by section of the prostate gland;

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* Thus, in the last two years, at Guy's Hospital, fifteen children under fourteen years of age underwent lateral lithotomy, without any unfavourable result; and it is not improbable that median lithotomy might have been similarly successful.

which latter proceeding undoubtedly
mination. Median lithotomy, therefo
ing and laceration of the prostate gla
a certain size, and in consequence wil
a fatal result. The lateral section stil
the safest; it was so with Cheselden, C
surgeons.

The most perfect and unique collect
operation, performed at a hospital of
for lateral lithotomy, will give more in
merits of the two operations; and w
the opportunity of presenting to our
so formed. By permission of Mr. W
insert his tables, and thus compare t
median lithotomy with the last 64
lithotomy performed at the Norfolk a
November 1869.

TABLE OF THE LAST SIXTY-FOUR CASES
PERFORMED AT THE NORWI

Ages of the patients operated upon.	Cured.	Died.
Under 5 years	16	
5 to 10	11	
10 „ 15	1	1
15 „ 20	1	
20 „ 30	1	
30 „ 40	1	
40 „ 50	2	1
50 „ 60	6	1
60 „ 70	15	4
70 „ 80	2	1
Total	56	8

ABSTRACT OF THE CASES OF M

Ages of the patients operated upon.	Cured.	Died.
Under 5 years	11	1
5 to 10	4	
10 „ 15	4	
15 „ 20	1	
20 „ 30	1	
30 „ 40	5	1
40 „ 50	1	
50 „ 60	7	2
60 „ 70	14	9
70 „ 80	3	
Total	51	13

TABLE OF CASES ON WHOM MEDIAN LITHOTOMY WAS PERFORMED AT THE NORFOLK AND NORWICH HOSPITAL. THE TABLE SHOWS THE AGE OF EACH PATIENT—THE RESULT—THE NUMBER OF DAYS UNDER CARE AFTER THE PERFORMANCE OF THE OPERATION — THE NUMBER OF CALCULI REMOVED FROM EACH CASE—THE WEIGHT AND DIMENSIONS OF EACH CALCULUS — WHEN MORE THAN ONE STONE WAS PRESENT, THE DIMENSIONS OF THE LARGEST ARE GIVEN.

By **Charles Williams**, F.R.C.S., Assistant-Surgeon to the Hospital.

No.	Age.	Result.	Days under care.	No. of calculi.	Weight.	Dimensions in inches.			Remarks.
						Length.	Breadth.	Depth.	
1	2	cured	22	1	14 grains.	$\frac{6}{8}$	$\frac{4}{8}$	$\frac{2}{8}$	
2	2	„	35	1	34 grs.	$\frac{6}{8}$	$\frac{5}{8}$	$\frac{3}{8}$	
3	3	„	23	1	14 grs.				
4	3	„	29	1	ʒij	$1\frac{1}{8}$	$\frac{7}{8}$	$\frac{5}{8}$	
5	4	„	29	1	35 grs.				Broken in extraction.
6	4	„	15	1	16 grs.				Broken.
7	4	„	29	3	30 grs.				Small calculi.
8	4	„	36	1	47 grs.	1	$\frac{6}{8}$	$\frac{3}{8}$	
9	5	„	50	1	15 grs.				
10	5	„	22	1	℈ij	$\frac{6}{8}$	$\frac{4}{8}$	$\frac{4}{8}$	
11	5	„	29	1	8 grs.				
12	6	„	22	1	ʒjss				Broken.
13	8	„	35	1	℈v	1	$\frac{6}{8}$	$\frac{4}{8}$	
14	10	„	16	1	3 grs.				
15	10	„	29	1	℈v	$\frac{7}{8}$	$\frac{5}{8}$	$\frac{5}{8}$	Removed entire. Lithates.
16	11	„	21	3	ʒiij ℈ij				All broken.
17	12	„	28	1	6 grs.				
18	13	„	29	1	℈j				Broken.
19	13	„	36	1	ʒij gr. x	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	Oxalate of lime. Removed entire.
20	19	„	56	1	ʒiij gr. x	$1\frac{1}{8}$	$1\frac{1}{8}$	$\frac{7}{8}$	A perineal fistula remained.
21	21	„	29	1	ʒvjss	$1\frac{1}{2}$	1	1	Oxalate; broken.
22	33	„	22	1	ʒij gr. x	$1\frac{3}{8}$	$1\frac{1}{8}$	$\frac{3}{8}$	
23	33	„	15	2	℈xiv	$1\frac{2}{8}$	1	$\frac{5}{8}$	One weighed ℈viij, the other ℈vj. The dimensions of the larger only are given.
24	38	„	36	1	ʒj	$\frac{5}{8}$	$\frac{4}{8}$	$\frac{3}{8}$	Broken into 3 pieces; phosphates and lithates.
25	38	„	22	1	ʒj	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{3}{8}$	Lithates; slightly fractured.
26	40	„	78		ʒix ℈j				Phosphatic; broken into fragments; a fistula remained.
27	47	„	28	2	ʒviij	$1\frac{3}{8}$	$\frac{6}{8}$	$\frac{6}{8}$	Lithic acid.
28	52	„	21	3	ʒv ℈ij	1	$\frac{6}{8}$	$\frac{1}{2}$	Lithic acid. One removed perfect; the rest broken.
29	57	„	29	5	ʒxij ℈ij	1	1	$\frac{4}{8}$	Each weighed about ʒij.
30	57	„	29	1	ʒiij	$1\frac{2}{8}$	$1\frac{1}{8}$	1	
31	59	„	16	1	ʒi gr. x	$1\frac{1}{8}$	1	$\frac{3}{8}$	
32	59	„	36	2	ʒiv	1	$\frac{6}{8}$	$\frac{4}{8}$	Lithic acid; both removed entire.
33	59	„	63	1	ʒvss	$1\frac{6}{8}$	$1\frac{2}{8}$	$\frac{5}{8}$	Lithic acid; entire.
34	60	„	15	4	ʒviij	$1\frac{2}{8}$	1	$\frac{5}{8}$	Each weighed about ʒij.

Table

No.	Age.	Result.	Days under care.	No. of cal-culi.	V
35	61	cured	37	1	
36	61	,,	31	10	
37	61	,,	28	1	
38	62	,,	58	several	
39	62	,,	36	1	ʒ
40	63	,,	69	1	℥
41	64	,,	50	1	ʒi
42	64	,,	29	1	46
43	66	,,	42	1	2
44	66	,,	36	5	ʒ
45	67	,,	30	1	ʒij
46	68	,,	29	2	ʒ
47	70	,,	22	1	℈
48	70	,,	37	1	ʒi
49	72	,,	50	1	ʒj
50	73	,,	42	several	ʒi
51	73	,,	29	1	ʒi
52	1½	died	1	2	ʒs
53	37	,,	13	1	ʒv
54	55	,,	3	2	℈v
55	57	,,	11	1	℥j
56	61	,,	9	2	ʒx
57	61	,,	9	1	ʒij
58	62	,,	18	1	ʒv
59	64	,,	86	3	ʒx
60	65	,,	11	several	ʒij g
61	66	,,	4	1	ʒvs
62	66	,,	2	1	℥j
63	66	,,	4	1	ʒxi
64	68	,,	14	1	6 g

The average number of days that each of the 51 cases of cure was under care, after the performance of the median operation, was 34.

The average number of days that each of the 56 cases of cure was under care, after lateral lithotomy, was 42.

In 64 lateral lithotomies 8 died, or one death to seven recoveries. In 64 median lithotomies 13 died, or one death to four recoveries. The average number of days each case survived the former operation was ten, the latter fourteen.

The Number and Weight of the Calculi removed from those who died after Median Lithotomy.

Under 5 years (æt. 1½)	1 calculus, weighing		ʒss.
From 30 to 40 years	1 ,,	,,	ʒvij.
From 50 to 60 ,, ...	2 calculi	,,	℈vij.
	1 calculus	,,	℥j ℈ij.
From 60 to 70 ,, ...	1 ,,	,,	grs. vj.
	1 ,,	,,	ʒvss.
	1 ,,	,,	℥j.
	1 ,,	,,	ʒxij.
	1 ,,	,,	ʒvj.
	1 ,,	,,	ʒiiss.
	2 calculi	,,	ʒx.
	3 ,,	,,	ʒx ℈ij.
	several	,,	ʒij gr. x.

The Number and Weight of the Calculi removed from those who died after Lateral Lithotomy.

From 10 to 20 years . .	1 calculus, which weighed		ʒiij ℈j.
,, 40 ,, 50 ,, . .	1 ,, ,,	,,	ʒix.
,, 50 ,, 60 ,, . .	2 calculi, weighing		ʒij.
,, 60 ,, 70 ,, . .	1 calculus	,,	ʒivss.
	1 ,,	,,	℥j.
	1 ,,	,,	ʒiv ℈j.
	1 ,,	,,	ʒx.
,, 70 ,, 80 ,, . .	1 ,,	,,	ʒiv.

Remarks by Mr. Williams on the cases of median lithotomy.

Two cases were cut twice by the median plan, at intervals of ine and four months respectively.

In no case did recovery result when the calculus exceeded 3 rachms 2 scruples; except in one case, in which the stone eighed upwards of 4½ oz., but a portion of the rectum and erineum sloughed, and a perineo-recto-vesical fistula was estalished.

In no case did a cure result
calculus exceeded 1½ inches,
the case in which the stone w

Calculi in th

The prostate gland, like ot
sation of its secretion, produc
pale or colourless bodies scat
structure. These at first are
matter, which Virchow believ
insoluble protein substance m
or later these formations are
membrane, causing phosphat
crusted upon the organic matt
calculi are formed.

Prostatic calculi, therefore,
in the gland-tissue. Their n
or more, like a bag of mar
grains of sand, or may incr
cherry-stone. As they gradu
tact with each other, and unde
they form facets or articulatio
dered as smooth as porcelain.

Their form, then, generally
angular, square, &c.

Their colour is generally th
whitish, black, or red; the
derived from the secretion o
transparent, pearly, like pearl

Their structure and consis
times of not very great consist
rally in concentric layers arou
with radiating striæ; and so
and brittle.

Their chemical composition,

Phosphate of lim
Carbonate of lim
Animal matter.

Although prostatic calculi i

in the gland-substance, becoming enveloped on all sides by its tissues, and forming for themselves a bed in the lateral lobes, and when enlarged encroaching upon the rectum, so as to be felt by digital examination; yet more frequently they distend the prostatic ducts, converting them into pouches, and appear at their open mouths, so as to be felt by the sound in its passage along the prostatic portion of the urethra. These calculi may project into the urethra, and thus have a free urethral surface and an adherent prostatic portion. Either of these surfaces may become enlarged, the prostatic portion attaining the size of an ordinary urinary calculus, and its urethral portion may extend backwards into the bladder, forming a prostato-vesical calculus.*

Sometimes one or more prostatic calculi may be detached from their recess and lie free in an open duct.

The other forms of calculi in the prostate are derived from a very different source; thus, a urinary calculus may escape from the bladder when small, and become lodged in the prostate: this may either obstruct the canal, or may be expelled along the urethra; or it may form a bed for itself in the prostate gland either by ulceration or pressure. These calculi are readily recognised on section as presenting all the characters of the ordinary urinary calculus, and as being totally different from he true prostatic calculus. But they so far resemble each other, that where a urinary calculus becomes lodged in the prostate, the successive deposits hereafter ensuing consist of phosphate and carbonate of lime; so that in external appearance they are somewhat like that of the true prostatic calculus. After lithotrity, and even after lithotomy, fragments of stone may become arrested or left in the prostate; so that after one, wo, three, or more years, a prostatic calculus may be developed, the nucleus being a fragment of a urinary calculus.

There is one other rare variety (the vesico-prostatic); it is hat in which a vesical calculus is situated within the bladder, ear its neck, which on increasing in size sends a prolongation hrough the vesical opening of the urethra into the prostate land. Here again it enlarges, both vesical and prostatic porons increase, and their bar of union remaining stationary roduces the same condition as is observed in the prostato-

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* See collection of cases in the *Guy's Hospital Reports*, 3rd series, vol. iii. 351.

vesical variety, viz. a dumb-b
It is singular that in the r
above was perfectly pervious,
the passage of a sound over t

The symptoms depend, of c
situation of the calculi, and v
very slight. Indeed in sor
symptoms whatever, and th
ascertained after death : wher
upon the urethra, there is a
perineum, and frequent mic
at the neck of the bladder ; t
and abscesses follow. Som
erections of the penis, and di

The diagnosis is arrived a
means of a sound or lithotri
ger into the rectum. Soft
recommended, which are to re
but these impressions may b
the bougie.

The treatment will consis
properly constructed forceps
free ; but, generally speakin
The operation is conducted
with these exceptions : the i
line, and should include a s
the escape of the calculus.
recommend that the case sl
that when the symptoms a
pushed back into the blad
applies to lodged urinary cal
the urethral forceps have fail
a large size, lateral lithotom

Calculi in the urethra are f
bladder and kidney, or fro
arrested at the narrower par
membranous portion, there

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* Such as Weiss's long urethra
blades are not pointed, should not
scooped ; or Weiss's canula forceps.

symptoms. However, in some very rare instances the calculus may be formed in the urethra, in this wise: urine collects behind a stricture or constriction, and a pouch or diverticulum thus ensues, wherein urinary deposit may take place and form the nucleus of a calculus, generally of the lithic-acid variety; but it is more probable that a particle of calculous matter or small particles of gravel have become arrested in this pouch and given rise to stone.

The size of the stone varies; where there is only one, it is generally of a larger calibre than the urethra in its transverse diameter, and assumes an elongated form; they may acquire a very large size; where there are several, they are often small and facetted, generally plane and smooth.

The symptoms are very variable—in some cases there are none at all; in others there is acute pain at the site of the alculus, and if this be rough, the pain is very excruciating. The urine may escape freely, or it may be passed frequently, or here may be a frequent desire with inability to micturate, or here may be actual retention; this latter symptom is more requently present where the stone is lodged in the fossa naviularis. When left alone, dilatation of the urethra ensues, xcavations and pouches are induced, ulceration of the urethra ollows, and sometimes rupture, causing infiltration and extraasation of urine, involving the scrotum; this is attended with igh irritation, fever, and constitutional disturbance. Suppuation may follow, and the abscess burst externally, allowing he exit of the stone, which is succeeded by urinary fistula. schuria and enuresis may likewise be produced; and in some are instances suppression of urine and uræmia may follow.

The diagnosis is generally easy by careful exploration of the anal with a small-sized sound or a long probe, the finger at the ame time being passed along the outside of the canal, so that hen the instrument impinges upon the stone, the finger may e placed on its vesical side, so as to prevent the pushing back the stone and its slipping into the bladder. Rectal examiation is oftentimes of service.

The treatment by endeavouring to facilitate the escape forards by means of suction and insufflation, as practised in rmer years, is obsolete, and inefficient for its purpose. There always a gradual tendency of the urine to push the calculus rwards; hence the surgeon often directs compression of the ethra to be made in front at the moment of micturition: when

the urine has been retained i
as possible, the compression i
the calculus may often follow
bath should be ordered, and t
which may prove successful.
resolves itself into the attemp
instruments passed into the u
ments have been devised bot
'and with some satisfactory r
have succeeded in their objec
perienced. We must bear in
extraction by means of force
canal and the patient. The q
after failure of the forceps, i
over the seat of the stone. M
down upon the stone, and t
slip back by planting the fing
upon the urethra behind the
clean incision either of extr
sion generally heals quickly
subsequent stricture or fistul
scrotum, provided it cannot
best to push it back into th
by incision. Incisions into t
are very often difficult to he
Should the calculus slip b
median operation, a long pa
duced, and the stone remove

Calculus in the female, alth
means so rare as is usually s
arrangements of the urethr
exterior render any obstructi
culus comparatively unfreque
there are no natural contract
short and readily dilatable;
that although females may b
as well as males, yet they es
retention in the bladder by t
We cannot judge of the freq
compared with males by the
for in the one instance a larg

or are removed by dilatation without operation, while, on the other hand, nearly all the males undergo lithotomy or lithotrity; and hence we have no data to rest upon.

The symptoms, when a stone has become so large as not to escape from the bladder, will consist of many of those already detailed in the male; but the special symptoms in the female consist in,—1st, bearing-down pains and pains along the urethra; 2nd, incontinence of urine. These are sometimes very distressing, and call for urgent attention.

The symptoms often simulate those of uterine disease, for which they are not unfrequently mistaken; so that the surgeon should be on his guard, and on failing to detect uterine mischief, he is bound to pay special attention to the bladder and rectum. Sounding and vaginal examination seldom fail to detect the stone.

The natural progress of calculus in the bladder which is not expelled by nature, and where no remedial measures have been resorted to, will be the ulceration of the stone through the bladder into the vagina, by which a cure is sometimes effected, but at the expense of a vesico-vaginal fistula; a circumstance which is always to be avoided if possible.

The methods for extracting calculi from the female bladder are the following:

1st. *Urethral dilatation.*—This mode is often performed by natural means, and even calculi of large size have been expelled hrough the urethra. Thus, there is a case on record where a young girl, æt. 18, passed spontaneously a very large calculus, $\frac{5}{8}$ inches long, 1$\frac{3}{8}$ inch broad, 1$\frac{1}{8}$ inch thick, and weighing 51 grains. She made a good recovery and escaped any after bad consequences.*

The dilatation may be artificially performed by the surgeon, ither by the slow or rapid process. The slow, gradual, and gentle method is very tedious, and consists in the introduction of olid or flexible bougies, gum-elastic catheters, prepared sponges, &c., the use of dilators, the speculum or blunt gorget,—inreasing the dilatation to the extent that the calculus may be emoved with the forceps. The second method is that by rapid ilatation under chloroform by means of Weiss's dilators, so hat the stone is removed by one sitting:—this proceeding is he one usually adopted now-a-days, and has been successfully

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* *Guy's Hospital Reports*, 1st series, vol. iii. p. 167, with plate.

performed in the extraction
subsequent incontinence of u
calculi from the bladder of
and with success, without a
largest of the calculi measure
and 1½ by 1½ inch in diamet
applied, measured not quite

Mr. Bryant† has furnishe
method, with a table of 28 ca
and others by the rapid proc
dilatation.

2nd. Dilatation with parti
dilatation has been carried o
stone is too large for extra
necessary. This is seldom n

3rd. Lithotrity—alluded
operation under chloroform i
ments removed at once: the
cessful cases of the kind; th
be adapted to the age of the

4th. Lithotomy. The pat
the same position as for m
duced into the urethra. A
that are required. The fol
performing the operation:
common and ordinary metho
sible direction, generally im
The incision into the uret
been analogous to the latera
viz. by introducing the knife
cutting downwards and ou
degrees. This is called the
tion; the objection to it is t
nence of urine. Others hav
of the urethra, but this has
Liston modified this operati
the bladder on both sides to
and then dilated. A transv
but without any additional s

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* *Med. Times an*

† *Med.-Chir. Tra*

been divided vertically, by some in the direction upward towards the pubes, but the space was found too small, even with subsequent dilatation; and by others downwards, as suggested by Chelius.

(2) Attempts have been made to extract the calculus by opening the bladder directly, as suggested by Celsus. This operation consists in making a transverse incision between the symphysis and urethra, and thus attacking the anterior parietes of the bladder; and M. Lisfranc modified this into a curved incision, under the name of the vestibular operation: these operations have found no recent advocates.

(3) The calculus has been removed by incision through the vagina; a very easy and expeditious operation, but which is followed almost necessarily by vesico-vaginal fistula and incontinence. Some make the incision longitudinally, and others in a transverse direction. M. Vidal's experience is derived from thirty operations without any death: he introduces a staff through the urethra into the bladder which is held in the median ine and its convexity made prominent in the vagina; a blunt gorget is next passed into the vagina deeply, so as to depress he inferior wall of the vagina (a speculum with one valve will do), and with the left index-finger the groove in the staff is felt, nd the bistoury plunged into it, taking care to avoid wounding he urethra; the stone is extracted by the forceps; a female atheter is introduced through the urethra into the bladder; nd the edges of the wound in the vagina brought together by uture. M. Vidal remarks that there is generally no hæmorrhage r peritonitis: but that fistula often follows.

Vaginal lithotomy has recently had some warm advocates, and s considered by them as the only justifiable operation for stone n the female bladder. The whole subject has been thoroughly nvestigated by Dr. Aveling:* he enters into the literature of he subject, and describes the operation minutely. The wound made in the operation is to be treated on the same principles s in the operation for vesico-vaginal fistula. The mortality stated to be 1 in 35.

(4) It has been recommended to remove the calculus by the upra-pubic operation, and the same remarks as were made especting the male will hold good for females.

Statistics respecting stone in the female, the operation and

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* *Obstetric Transactions,* vol. v. pp. 1 et seq. 1864.

its consequences, and the mo
plete and unsatisfactory.

Calculi in the bladder, obst
may not be aware of this forei
when, being seated either be
child or between it and th
impediment to the progress o
struction of course will depe
the *Edinburgh Medical and*
there is a report of a case b
was obstructed by a stone in
after death, was found to wei
surement being 3⅝ inches lo
nature of the case was not
catheter was passed to ascer
the child's life sacrificed by p

Velpeau (*Art des Accouche*
in which a calculus weighi
bladder of a woman four m
who afterwards was delivered

An obstructing calculus is
pain; but it sometimes happ
wedged between the head
pubes.

If the calculus, during the
upper part of the vagina, it
head descending into the p
obstruction; but if the calcu
and be placed below the
difficult.

Treatment.—If the calcul
it should be removed before
be practised with safety d
until the patient be in labou
seated in the cavity of the b
the case may be left to the n
large, or if it be placed bel
have recourse to some meth

a. In some cases the ston

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* Lever, *Guy's Hospital*

pushed back into the cavity of the bladder above the brim of the pelvis. This *reposition* is recommended by Smellie, Denman, Baudelocque, Dubois, &c.

b. When the calculus is fixed and does not admit of reposition, it must be extracted in one of three ways. 1st. *Dilatation of the urethra.* 2nd. *Lithotomy.* 3rd. The high operation, or *suprapubic lithotomy.*

ALFRED POLAND.

DESCRIPTIO

Fig. 1. *Uric Acid Calculus.*—Sho
external layers are concentric, of a ye
consists of the crystalline, radiating,
which gives it a reddish hue. The dr
Catalogue of Calculi, in the Royal C
modified.

Fig. 2. *Urate of Ammonia Calcul*
earthy phosphates disposed in layers
brittle and homogeneous. It was s
boy æt. 5, by B. B. Cooper.

Fig. 3. *Cystic Oxide Calculus.*—
structure, of a radiating character.
transparent and glistening. After
bluish-green colour. Taken from P
cit).

Fig. 4. *Oxalate of Lime Calcul*
oxalate of lime, arranged in an im
agate; its colour is of a dark maho
is tuberculated and mammillated.
moved from the bladder of a boy æt.
ptoms of stone until two weeks befo

Fig. 5. *Uric Oxide or Xanthic*
Fig. 2, Catalogue of Calculi (op. ci
flesh-colour, and its structure dispos

Fig. 6. *Phosphate of Lime Calcul*
laminated variety, and not that vari
mortar. It is of a greyish-white
Museum.

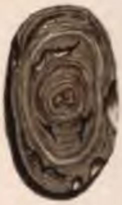
Fig. 7. *Triple Phosphate Calcul*
nucleus. It is confusedly crystalli
laminated, and is of a whitish colour

Fig. 8. *Fusible Calculus,* with lay
chalk, white, more friable and eart
composed of concentric laminæ, and
from Prep. 2158, Guy's Museum.

Fig. 9. *Alternating Calculus.*—Tal
Calculi, Royal College of Surgeons
monia, mixed with oxalate of lime: t
secondly, by uric acid; and lastly, b
the earthy phosphates.

URINARY CALCULI.

2



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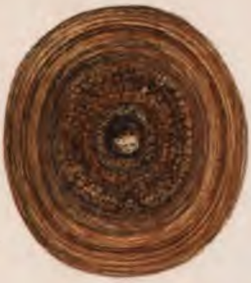

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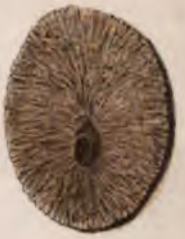

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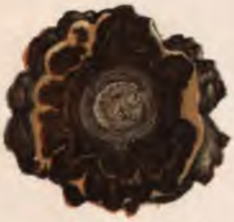

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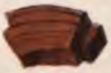

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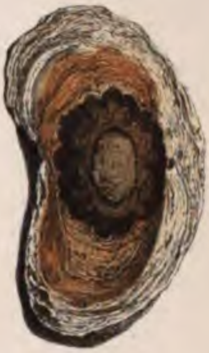

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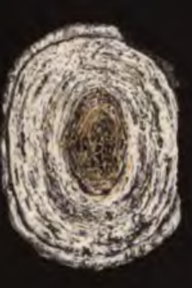

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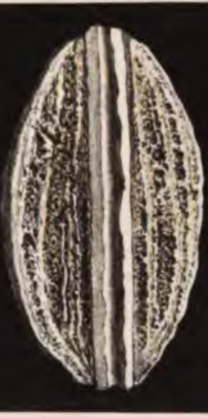

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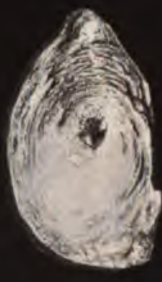

E. Burgess chlith. ad nat.

M & N Hanhart imp.

ON LITHOTRITY.

THE amount of mortality attending the operation of lithotomy in the adult has always made it a question of paramount importance with surgeons to discover some more successful method of removing a calculus from the bladder.

It is not necessary here to allude to the attempts made from time to time to get rid of the calculi by injecting solvents into the bladder.

The removal of calculi from the bladder through the urethra was effected by Sir Astley Cooper and Sir Benjamin Brodie before the introduction of lithotrity into practice. These surgeons were in the habit of removing small calculi with an instrument called an urethra-forceps. Sir William Blizard is also said to have performed this operation. And in this way patients were successfully relieved of small calculi; in one case, as many as a hundred being thus removed.

To give a detailed account of the early history of lithotrity would now be of little interest. Whether the credit of originating the operation is due to the Spanish monk or to the Indian officer—who both performed an operation on themselves for the purpose of breaking a stone in the bladder—is not now of much importance. It is admitted that to M. Civiale we are indebted for the operation as practised at present.

Among those who have written on the subject, and whose works may be consulted for a history of the operation in all its earlier stages, are Gruithuisen, Elderton, Civiale, Amussat, Leroy d'Étiolles, Heurteloup, King, Costello, Bellinaye, Coulson, and others.

Baron Heurteloup [*] was among the earliest who performed the operation in this country. At first, several instruments were used by him, such as the perce-pierre, trois bra virgule, évideur or forceps, &c.; the intention being to the stone, and break it up by drilling holes in it: he even made use of an instrument invented by Mr. Weiss, calle sliding forceps, to which he applied a hammer, the stone broken by percussion. All these instruments and mod operating have been, for many reasons, superseded by the now in general use, viz., crushing the stone by means lithotrite.

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[*] See *Principles of Lithotrity*, by Baron Heurteloup. London, Whittaker and Co., 1831.

Sir Benjamin Brodie, who paid great attention to lith on its first introduction, and to whom is due much simplicity of the present mode of operating, says, i 'Lectures on Diseases of the Urinary Organs':* 'Many ago Mr. Weiss made an instrument on the principle of I have called the sliding forceps, having a screw † attach it for the purpose of dividing calculi while still in the bl into fragments; but it was of rude construction, and, su it then was, was certainly not fitted for use on the living ject.' 'Baron Heurteloup at first pursued M. Civiale's m of operating; but finding it liable to some very serious tions, he adopted the principle of the sliding forceps inv by Mr. Weiss, at the same time modifying its shape so render it more convenient for being passed into the bl and for seizing and retaining the stone afterwards. B this he made another change in the instrument, rejectin screw, and substituting for it a peculiar apparatus enabled him to crush the calculus by a stroke of the har Now the first of these alterations, made by Baron Heurt I believe to have been of essential importance; in fact, wi it, the instrument would have remained wholly inapplica any useful purpose. But as to the second alteration I cann that anything that I have seen, either in my own practice that of others, would lead me to regard it as being any imp ment whatever.'

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[*] *Brodie's Works*, edited by Charles Hawkins, vol. ii., pp. 652-680. mans, 1865.

[†] The application of the screw was first suggested by the late Mr. H formerly surgeon to the Birmingham Hospital, who early practised lit He had been a successful operator, having performed lithotomy eig times, with only four unsuccessful cases: he was the surgeon referre Sir Benjamin Brodie in his work on *Diseases of the Urinary Organs*, as recommended, in lithotomy in the female, division of the urethra imme below the symphysis of the pubes.

Sir Benjamin Brodie in his early operations was accustomed to use an instrument—a scoop lithotrite—so constructed that a portion of the crushed calculus always remained within the blades; by this means a considerable quantity was removed at each operation by the repeated introduction of the instrument. But this method was attended with great objections; the withdrawing the instrument loaded with fragments stretched the urethra beyond its natural size, giving much pain at the time, as well as afterwards. When the urine was passed, it was occasionally attended with some bleeding, and in some instances the urethra was torn, fragments lodging in the torn portion; infiltration of urine, followed by perineal abscess, were the consequences, and in two such cases death resulted. In referring to these cases, in his *Notes on Lithotrity* in the 38th volume of the *Medico-Chirurgical Transactions*, he says: 'The experience of these cases led me some years since to discontinue the use of the forceps already referred to, or at least to have recourse to it very rarely, and only under some special circumstances, and to substitute for it a forceps made by Mr. Weiss, in which there is a longitudinal opening in the curved part of the fixed blade, with a corresponding projection in the opposite or sliding blade. The effect of this instrument is to crush a calculus very completely, and in such a way that no part of it remains between the blades, the whole being left to be passed with the urine afterwards. The ultimate cure of the patient may in some instances be thus a little (but not greatly) protracted; but this inconvenience is more than compensated by the smaller amount of pain which the patient suffers, the smaller liability to rigors, and the complete absence of danger from the infiltration of urine and perineal abscess.'

This instrument, now called the 'screw lithotrite,' is the one in very general use. Alterations have been made in it. The rack and pinion, applied instead of the screw, was originated by Sir William Fergusson, and is used by that surgeon. Sir Henry Thompson uses an instrument that he strongly recommends. These are delineated in the article on SURGICAL INSTRUMENTS. Mr. Coxeter, and more recently Mr. Weiss, have also made alterations, by which it is intended to allow of more rapidity in operating, and to gain lightness in the make of the instrument; but I must confess that, notwithstanding the high authorities in favour of these different instruments, the

considerable amount of irritation
ments have not previously been us
patient confined to the sofa for a da
nation is made; and should the gen
such medicines as may be necessary.

In examining the bladder, inste
better mode is, having placed the
pelvis raised by means of a pillow,
through a silver catheter about fou
to the catheter should be attache
water may be retained in the bladde
If the stone be of any size, it is us
the catheter; but should this not
may be introduced, and an exami
manner as will be described when it
calculus.

Having ascertained the presence
that lithotrity is the operation to b
to place the patient in as favourable
he has to undergo. One of the
bladder should be able to contain a
to render the necessary use of instr
unfrequently required, on account
bladder to a sufficient quantity, to i

instrument a few times on different occasions before proceeding to crush the stone.

The bladder and urethra being thus prepared, the following is the mode of proceeding to be adopted. The patient should take a dose of aperient medicine the day before, and be confined to the house for a couple of days, so that the urinary organs should be in as quiet a state as possible. The patient being placed on a sofa, with the pelvis raised as before described, from four to six ounces of warm water should be injected into the bladder; it is as well to have the piston of the syringe graduated, so as to know exactly the quantity of water injected. Should there be much spasm, so that the bladder resists the introduction of the water, this part of the operation must be conducted slowly, only a small quantity being introduced at first; indeed, if it is found that the bladder will not retain the requisite quantity, the further performance of the operation must be postponed to a future occasion. In some cases, where this intolerance continues, the following plan may be adopted: desiring the patient to retain the urine for as long a time as possible previous to the operation being attempted, and the surgeon being satisfied that a certain quantity of urine is in the bladder, he may introduce the lithotrite, and crush the stone *once*; when a stone has been once crushed, this irritation of the bladder not unfrequently ceases. It is the practice of some surgeons not to inject any water into the bladder before the introduction of the lithotrite. I have found that the bladder more readily retains the water injected than the urine that may be in the bladder when the lithotrite is introduced.

The principal requirement in the operation of lithotrity is, that the calculus should be broken into pieces of such size as may be readily passed; and it is to be considered what is the best method of accomplishing this with as little disturbance to the bladder as possible. The size of the instrument must depend in some measure on the supposed size of the stone, which there is no mode of ascertaining with any very great accuracy; if the stone is not large, a medium size is all that will be required; but should there be any doubt as to the size of the stone, a large instrument should always be used on the first occasion of operating.

The introduction of a lithotrite, from its shape, is more difficult than a catheter; and the passage of a lithotrite through

the neck of the bladder requires ca
some amount of pressure is occasio
there exists much enlargement of t
siderable difficulty is occasionally me
manipulation this is overcome. It is o
this step of the operation, that no at
open the blades of the instrument un
bladder; much mischief is sure to e
is made. The next step is the mani
seizing of the stone; on this grea
Benjamin Brodie, in his *Notes on Li*
should be to *move the forceps in the bl*
never using it as a sound for the
bladder, or ascertaining the position c
examination does not assist the surge
afterwards; it gives pain to the patie
contract and expel the water which had
and I know that instances have occurr
practice, in which a rough handling
great injury to the bladder, ending in
The rule for seizing the calculus (wh
to have first learned from witnessing
tions of M. Heurteloup) is as simple
lying on his back, the handle of the
of course brings the convex part of
in contact with the posterior surface
contiguous to the rectum. The forc
by withdrawing the sliding blade to
according to the probable size of the
being at the same time pressed gentl
tion of the rectum. The object of
the forceps, being below the level o
bladder, the calculus may fall into it
it is generally successful. If it sho
without being moved from its situat
with the hand on one side, or on i
slight concussion thus communicated
bably be sufficient to dislodge the cal
the grasp of the instrument. If it
forceps, being closed, may be very ge
to one side or the other, so that the c
make an angle of 25° or even 30° wit

body, then opened, and pressed in the direction of the rectum in the manner already described.

'When the prostate gland is much enlarged, there is sometimes a difficulty in seizing the calculus, arising either from it lying under that part of the gland which projects into the bladder, or from the impediment which it offers to the elevation of the handle of the instrument. For such cases the operating-table invented by M. Heurteloup, which enables the patient's shoulders to be suddenly lowered, is very convenient; or the same purpose will be answered sufficiently well if the patient be placed on a light sofa, the end of which may be raised by an assistant. The calculus is then seized, not in that part of the bladder which adjoins the rectum, but in the fundus, this being rendered the lowest point by the elevation of the pelvis.'

Fig. 307.

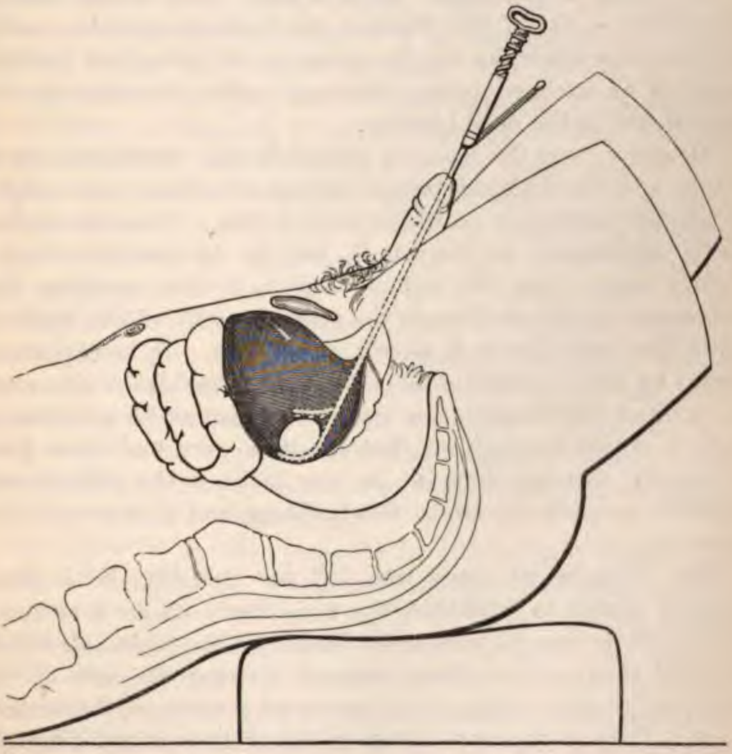

Diagram of the ordinary method (Brodie's) of seizing the stone.

M. Civiale recommends anot
Sir Henry Thompson in his
trity:* 'The other mode is tha
reverse of the preceding. By
of the bladder and space benea
operation; no depression is m
of the bladder and the instru
avoided. The instrument is a
ation which this naturally ta
avoids moving it, or any mov
however slight. It is only due
first named to say that this,
the improved, method, is in
provements which have been
years. The method was scarce
struments existed.

'We shall now consider it
entered the cavity of the blad
and smoothly down the trigone
organ is an inclined plane, a
atonied and in the dead bladde

'In many cases the stone is
passes, and the slightest later
or left will determine on whic
tor is careful not to disturb
slightly away from the side
instrument gently in towards t
while the male blade is slow
always to bear in mind, that
the neck of the bladder, the m
since it would impinge on th
or injury. Having done so,
lithotrite towards the stone, sl
seizes it.

'But suppose no stone wa
directed simply to withdraw t
in the middle line, to incline t
45°, and then to close them, w
shaft, or otherwise disturbing t
ment. Thus in almost all posi

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* London, C

by the blades of the lithotrite, and very rarely by their extremities. If no stone is felt, he turns them, opened to the left in a similar manner, and then closes them. Observe, that the blades are always to be opened before they are turned, for this reason: if the turn is first made and the blades are subsequently opened, the chance is that the male blade as it is withdrawn will move the stone away; whereas if the blades are inclined while open, the stone, if there, is almost certainly seized. This is one of the many apparently minute but extremely important points of which systematic lithotrity is made up. To return: it is very rare that the stone will elude the search thus far; but if it does, depress the handle of the lithotrite half an inch or so, which raises the blades very slightly from the floor of the bladder, and turn them another 45° to the left, bringing, in fact, the blades horizontal to the left; close: if unsuccessful, turn them gently to horizontal on the right, and close. These five positions (vertical, right and left incline, right and left horizontal) explore the bladder fully, middle, right, and left, and will almost certainly find any stone of a moderate size in a healthy bladder. The object is at the same time strictly to avoid communicating any jerk to the instrument or to the bladder. In all these movements, if properly executed, there has been barely contact of the lithotrite with the vesical walls; at all events, no pressure, nothing to provoke undue pain, or cause contractions of the bladder. If, however, there is an enlarged prostate, causing an eminence at the neck of the bladder, a depression behind it, or the stone is very small, or we are exploring for some fragment, at the close of the case, which is suspected to have eluded previous search, the blades may be reversed so as to point downwards to the floor, and the object sought may then often be secured with ease. If seeking for a small stone or for fragments, we shall employ a lithotrite with short blades, which can therefore be reversed with much greater ease than one with long blades.

'In order to do this properly in the normal bladder, the handle of the lithotrite is depressed another inch or so, between the patient's thighs, so that the line of the instrument, instead of being directed obliquely a little upwards, is level with, or even points a little below, the horizon; the blades, supposed to have been already brought to the horizontal as before described, are cautiously turned, about 45° say, to the right (right reversed incline), so as to point obliquely to the floor, which should be

barely felt, or very lightly touched
be made on this part of the bladd
ment, and it is easily avoided b
handle of the lithotrite. Then
them back, that is upwards, ove
incline), and close. Lastly, they
reversed vertical position, and the
quires the maximum depression
necessary to pick up small frag
instrument. But when the prost
and a stone or fragments have
lithotrite is reversed without depr

‘All these movements are to b
centre of the vesical cavity, the pr
out hurry, rapid movement, or a
the nature of a jerk or concussio
bladder, without causing more tha
to the patient. The operator's
with the scale marked on the sli
glance the exact interval which it
the blades in the bladder.

‘It is essential to good practi
lithotrite, to maintain the axis
possible, always in the same direc
be moved; the shaft should occup
when this is intentionally altered.
blade, the operator is very apt to
each turn of the screw, unless he i
sary to avoid this evil. All lat
and concussion, necessarily tell on
prostatic urethra, where the inst
braced, and its mobility is most
lithotrite which occupies the ant
much freedom of lateral movem
bladder the instrument is free, al
the axis, or fixed point, as regard
part indicated, which is also th
entire passage. Hence the aim
produce in this situation no mo
that on its own axis. Few of th
quire more practice to master tha

‘There is one important rule wi

of the calculus in the bladder. The larger it is, the more certain it is to be found lying near to the neck of the bladder in the ordinary recumbent position, while a small one is usually detected at the back of the trigone. This position of the large stone requires a different method, and it will be found almost invariably successful. The moment the lithotrite enters the bladder, it is not to be pushed onwards to the bottom of the cavity: first, let the blades be inclined away from the side on which the stone is felt, then push on the female portion of the instrument only, by itself as far as it will go, maintaining the male blade at the neck of the bladder; it is now only necessary to incline towards the stone, and it will be seized almost certainly at once. But if the operator commences by pushing on the whole instrument, and then withdraws the male blade according to the ordinary custom, this blade is infallibly drawn against the large stone, which it therefore fails to catch, and presses it back against the neck of the bladder, producing

FIG. 308.

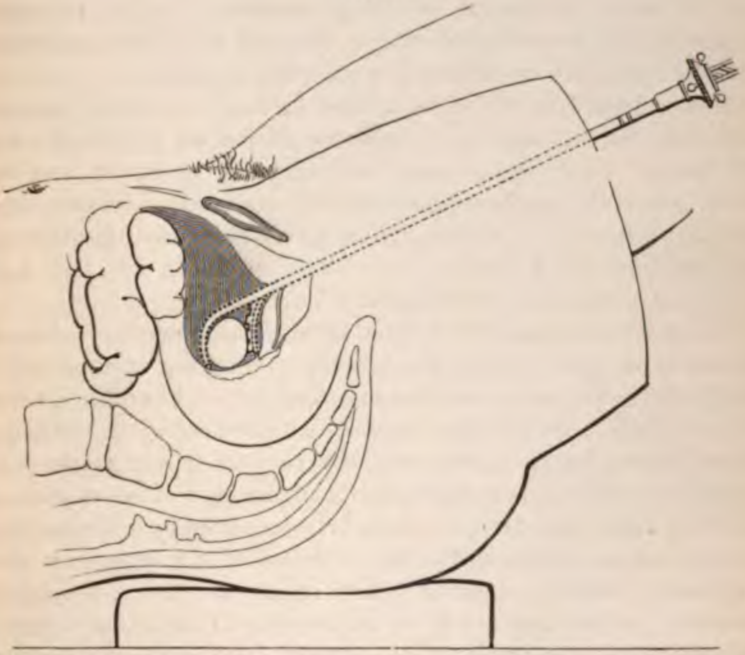

Diagram of Civiale's method of seizing the stone. From Sir H. Thompson *On Lithotomy and Lithotrity*, p. 177. 1863.

pain, irritation, and perhaps bleeding: this is a practica of importance. As already intimated, for a small ston instrument glides down to the posterior wall of the bl the male blade is withdrawn, and the stone caught in the manner.

'Such then, in the main, is the method of Civiale for fi the stone; the other, or English method, is without dou efficient one, but I believe it to be more irritating to the bla and less certain for removing every minute fragment to the end of the operation, while it fails to deal efficiently w stone lying behind an enlarged prostate. Hence the cru operation has been often said to be inapplicable when suc ease exists, a conclusion wholly unwarranted by the pr and results of modern lithotrity. Having tried both me myself, I have no hesitation in preferring the former.'

Notwithstanding the opinion thus strongly expressed b so competent to come to a right conclusion on this mat Sir Henry Thompson, I am still inclined to prefer a recommend the method practised with so much success b Benjamin Brodie, as the one less likely to cause irritat the bladder; and I have not found it attended with the advantages described by Sir Henry Thompson.

The calculus being seized by either method, the question arises—how often should the process of crushing be repe In the first operation, the surgeon should often be satisfied crushing the stone but once, especially if the bladder is irri One crushing frequently relieves the patient of much pai irritation of the bladder, particularly in the case of large st and it is well to give the patient as little inconvenience as pos at the first operation, so that he may look to a repetition out dread. On the occasion of first seizing the stone, I us move the instrument gently to either side, to ascertain if be more than one stone. The lithotrite being carefully drawn—care being taken that the blades are quite closed patient should at once go to bed, taking a glass of warm and-water or brandy-and-water, and be kept warm, in ord prevent his having a rigor; he should for the next twelve make water in the recumbent posture, and be confined t house until the next operation.

The period that should elapse between the operations vary; if at the first operation the calculus has been cru once only, unless it be a small one, in all probability no nents will be passed; in which case the operation may be epeated usually in three or four days. During the intervals etween the succeeding operations, the patient may be allowed o take a certain amount of exercise.

It is of considerable importance to determine how much should e done at each operation; on this question surgeons differ. ome do a great deal, whilst others are satisfied with seizing he stone only once or twice, and repeating the operation at uch shorter intervals. Some place the patient under the in- uence of chloroform, and continue seizing and crushing the one until the whole is broken up, at one operation. This tter plan is accompanied with this disadvantage: where a rge stone is thus crushed into pieces capable of being passed, e passage is liable to be blocked up with the fragments, which sults in a difficulty in getting rid of them, and much conse- uent irritation of the parts. The wiser plan is to adopt an in- rmediate method, and to do at each operation so much only the patient can bear without great inconvenience, so as to nder as few operations as possible necessary; whilst on e other hand, the patient is not distressed by the manipula- ons being continued too long at one operation. From five to n minutes is the average time the lithotrite should be em- oyed in the bladder.

The interval there should be between the performance of e operations, is the next question to be considered. As rule, I never repeat the operation whilst any fragments are ing passed, and I usually allow one or two days to elapse ter the fragments have ceased to come away; this usually quires about a week between each operation.

With regard to the removal of the fragments by means of an strument, I have found no reason to alter an opinion I rmerly expressed, and which was published in the *Transactions the Pathological Society* for the year 1850 :—

'In relation to the occurrence of infiltration of urine, and scess after lithotrity, Mr. Charles Hawkins thus expresses mself: He believed this accident might be entirely avoided, the operation of crushing be performed with the lithotrite that is, if the operator is satisfied with crushing the stone, d not attempting to withdraw the fragments between the aks of the instrument. He believed this accident never curred except where the urethra had been lacerated with a ece of stone during the withdrawal of the instrument; then

impaction of a fragmen
parations exhibit; but w
rated, impaction is of l
symptoms are likely to r
Since no attempts have
the bladder in the instru
dent. . . . As far as his
to attempt the removal o
stone is *well crushed*, it m
be evacuated of the fragr
in passing them, he had
out the bladder.'*

It is not necessary to i
at each operation, if the
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It is desirable that some
renders it better able to
In performing lithotrity
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as possible.

When there is much
and the patient on this
fragments, and their re
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the scoop-lithotrite; an
patient lies being raise
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this plan being now the
vented a very good app
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Among the difficulties
of a case are the followi
tion retention of urine
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been attempted: this mu
of the catheter. A fragr
passage, after it has left
been no laceration of th
things, although trouble
fragment lodges in the n

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* *Path. Trans.* p

urethra, a full-sized gum catheter should be used, and the piece gently dislodged and pushed back into the bladder. Many ingenious instruments have been devised for the purpose of seizing and removing fragments thus arrested; but of all, the catheter will be found the most simple and most useful. Should the fragment be retained in the anterior portion of the urethra, it usually makes its way out in course of time; to facilitate this, the patient should retain the urine for as long a time as possible, and pressing the penis at the other side of the stone for a short time when the bladder is about to act, the piece is washed out. Fragments sometimes lodge just behind the meatus; with a common dressing-forceps they may be removed from this position; in a few cases it may become necessary to make a slight incision in the lining membrane of the urethra. The passing of fragments sometimes gives rise to inflammation of one or both testicles; this may delay the operation. The chief cause of mischief to be apprehended is when there is considerable irritation, followed by inflammation of the bladder, the urine depositing a quantity of ropy mucus, giving rise to great pain in the passage of water, and a constant desire to pass it. These cases require very careful treatment; depletion is rarely necessary: with the use of the warm bath and the administration of opium and hyoscyamus, the patient being kept to his bed or the sofa, the attack usually passes off. But these are signs that the bladder will not bear any lengthened operations. This state of bladder is sometimes caused by a fragment of stone, which is both too large and too small—small enough to enter the neck of the bladder, but too large to pass further; in this case, notwithstanding the irritation that may be present, the lithotrite should be introduced and the fragment crushed, when generally the symptoms subside. The bladder will in many cases continue to secrete a quantity of ropy mucus as long as any stone remains, so that there is no reason for not proceeding with the operation; the patient may take daily half a pint of the decoction of the Pareira brava; but the treatment really requisite is the removal of the stone. Nevertheless these cases are occasionally not so easily managed, and sometimes it may be necessary to cease all operative proceedings for a time, until the bladder becomes in a more healthy state; it may, indeed, happen that the attempt to remove the stone by lithotrity must be abandoned: this, however, occurs but very rarely; usually with proper treatment,

these unfavourable sympton
Sir Benjamin Brodie, in hi
following case :—

> In a fourth case, a very small c
> single operation. The operation wa
> as is usual, in a perspiration. A
> marked by a frequent pulse, a furred
> and attended with a deposit of adhes
> the urine. These symptoms continue
> itself in one groin. The abscess ha
> of matter took place, and was followe
> The patient seemed to be in an im
> weeks after the operation, he sudden
>
> On examining the body, no remai
> bladder. The mucous membrane of
> There was an abscess of the pelvis,
> and rectum, and extending in the
> groin, in which the puncture had
> dissected and examined by the late
> with me in consultation), Mr. Charle
> St. George's Hospital, and myself;
> bladder, nor any kind of communica
> the abscess. Still I cannot doubt t
> the operation. Probably a very smal
> trated the coats of the bladder, allo
> of urine into the cellular membrane.
> for an extensive suppuration, at the
> so small a puncture might at once
> wards.

In this case the cause of d
degeneration of the heart; an
have little doubt but that the
the operation.

In those cases where a fra
urethra, usually in the mem
parts have been lacerated, in
will be followed by infiltratio
the surgeon must lay open t
where this treatment was fol
covered.

The number of times it may
tion must necessarily depend
amount of crushing that is pe
the facility with which the
patients pass very considera
quire the pieces to be very sm

operations. In the cases operated on by Sir Benjamin Brodie, with those that have occurred in my own practice, the number of operations averaged between six and seven; one or two operations sufficing in many cases of small stones. Mr. Prescott Hewett has operated in one case as many as nineteen times and with ultimate success.

It is occasionally a wise plan, in cases in which there have been many operations, and the patient begins to feel the confinement and the recurrence of the operations, to cease altogether for a time, so as to allow him to recover his usual health; of course before dismissing the patient as cured, the surgeon must be satisfied, by examining the bladder, that no stone remains. In some cases where the fragments are too small to be seized by the lithotrite, or rather where, from their size, they fall through the opening in the blades of the instrument, and yet do not pass, the introduction of a full-sized catheter (which should be retained in the bladder for a short time) will enable the patient to void them.

The placing the patient under the influence of chloroform is by some surgeons much recommended. As a rule, I do not think it advisable to make use of it, but only to have recourse to it in those cases where circumstances may render it necessary. In ordinary cases there is not only no occasion for it (for lithotrity, if properly performed, is not a painful operation), but, on the contrary, it is as well to do without it on account of the operator being thus better able to ascertain to what extent the patient can bear the operation at each time, so that he should not proceed so far as to cause the bladder to resent the operative proceedings. The bladder does not retain the water so well when chloroform is employed. When patients are peculiarly sensitive with regard to the operation, chloroform must be administered; for without it such patients could not be induced to submit to the operation, however favourable their cases might be in other respects.

I operated on a patient twenty-four years of age, who had symptoms of calculus when a child. They had for many years remained dormant, but had recurred about four years before he had consulted me, at which time he was making water incessantly and with intolerable pain, the urine depositing a large quantity of ropy mucus mixed with blood; in fact, the bladder being in as unpromising a state as possible for any operation. Having seized a very large stone with the lithotrite, I was unable to proceed with the operation on account of the patient being incapable of exercising the necessary control over himself; but, under chloroform, I was enabled to effect a complete cure in five operations. It

would have been impossible to hav
In the 41st volume of the *Medico-C*
in which I operated successfully on
tion between the bladder and inte
was some vegetable matter, was o
with a very large lithotrite. The p
that he was anxious to be placed un
third occasion of operating, it was
the operation was borne as well as
held more water.

In such cases chloroform
of cases, it is not requisite, a
not to have recourse to it.

In considering in what ca
lithotomy, it may be observ
operation were of opinion t
very small, requiring but o
and kidneys perfectly health
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ments used and in the mod
great measure to alter this
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bladder, and the stretching
of the urethra, rendering it
of fragments, led to most d
practice of removing the fr
instrument has been laid a
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fully treated. The inabilit
fragments was also consider
not applicable. Yet now, aft
these cases can be managed
a silver catheter. It may b
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although on the withdrawal
might lacerate the urethra,
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of the urethra were injured.
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the bladder—under the idea

more immediately in contact with the fragments, their removal is more readily effected; which is rather a theoretical than a practical improvement, and the catheter has the disadvantage of having the aperture in the lower curve. There is no doubt that a healthy state of the bladder is very desirable when lithotrity is to be employed; but I have performed it with success when the bladder has been in a very considerable state of irritation and secreting much ropy mucus. This irritation and secretion of mucus diminish as the operations are performed, and nearly cease before the whole of the calculus has been removed. These cases certainly require much caution in their management, still they are by no means cases in which lithotrity is to be rejected. The inability of the bladder to hold the requisite quantity of water might at first deter a surgeon from selecting such cases for the operation; but, on the other hand, a little management, by injecting the bladder for some time previous to operating, generally overcomes this obstacle, and not unfrequently, where a bladder has been very intolerant of water, this inconvenience has subsided after the stone has been once crushed. Where there is serious disease of the kidneys, lithotrity is no doubt as likely to be attended with ill consequences as lithotomy. But cases do occur where the presence of kidney disease would inevitably render lithotomy an unsuccessful operation, in which lithotrity may be employed, if not with entire success, with at least the alleviation of much suffering, and prolongation of life. The worst form of kidney disease, albuminuria, is fortunately not frequently found in combination with calculus in the bladder at the period of life at which it is desirable to perform lithotrity. In cases of very bad stricture of the urethra, rendering the introduction of the lithotrite impossible, lithotomy must be had recourse to; but in cases in which a considerable amount of stricture existed, I have been enabled, by using a small lithotrite, and crushing the stone very fine, to relieve the bladder of a considerable-sized stone. But now that stricture is so readily removed by Mr. Barnard Holt's 'immediate treatment,' it ceases to be so serious an objection. Malignant disease of the bladder, in combination with calculus, of course precludes lithotrity as well as lithotomy.

The removal of foreign bodies that have been introduced into the bladder, such as bougies, may be effected with a scoop-lithotrite.

In cases in which the bladder is u
itself, the urine left soon becomes decon
irritating the mucous membrane, and
quantity of phosphate of lime, or phos
lime, which, being mixed with the mu
bladder, gives rise to great irritability o
cases the removal of this soft calculous
plished by means of the scoop-lithotr
the mischief remaining, these formatio
and in some instances give rise to the o
had failed in the previous operation
the formations, which is not always th
to be adopted to prevent the formation
the constant washing out of the blad
These cases are usually very troubleso
ment is not persevered in, the disease
up disease of the kidney, under which
sinks.

Women are naturally, from the fo
passages, favourable cases for lithotrit
to be performed in the manner that h
viously for the other sex. The cure in w
than in men, as the fragments pass m
obvious reasons why it is desirable that
under the influence of chloroform. It
women, with hardly an exception, lith
be employed.

It is very generally admitted that
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be performed, not only on account of
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also on account of the necessarily small
to be used rendering it difficult to have
power to crush stones of the size frequ
and the almost impossibility of carryin
tinuous treatment necessary to bring
issue.

The composition of the stone is no
siderable importance; perhaps those
lime require more force in the applic
and the fragments cause more pain i
but this is fortunately a calculus not ve

In comparing the relative successes of lithotrity and lithotomy, Sir Benjamin Brodie, in his *Notes on Lithotrity*, makes the following remarks :—

'It would be unreasonable to expect that any method of treatment for the relief of a disease so certainly fatal if left to itself, and productive of so much misery, as calculus of the bladder, should be constantly and uniformly successful. If lithotomy has its dangers, lithotrity has its dangers also; and the only question for the practical surgeon to consider is, which is the least dangerous of the two. Of the nine cases which I have enumerated, it may well be doubted as to one of them whether the attack which was the immediate cause of the patient's death was really connected with the operation; while in two others the fatal result was to be attributed to a mode of performing the operation which my later experience has led me to abandon. But, even if we admit the whole nine cases as a fair example of the average failure of the operation, the proportion of deaths to recoveries is somewhat less than 1 in 12½.

'In order that I might compare this with the proportion of deaths from lithotomy, I have referred to a paper by the late Mr. R. Smith, of Bristol, published in the eleventh volume of the *Transactions* of this Society, and entitled *An Inquiry into the Statistics of Stone in the Bladder ;* and I there find it stated, that in the Bristol Hospital, during a series of many years, the average of deaths after lithotomy was 1 in 4½ ; in the hospital at Leeds, 1 in 5 ; and in the hospital at Norwich 1 in 7¼.

'Thirty-five years have elapsed since the publication of these statements, but there is no reason to believe that the success of lithotomy is greater now than it was when Mr. Smith collected his observations. The editor of a weekly journal (the *Medical Times and Gazette*) has for some time past published the statistics of the various operations performed in the London hospitals, including lithotomy. The facts seem to have been collected with some care, and are probably a near approximation to the truth. Mr. Charles Hawkins has been at the pains to collect from the various numbers of that journal, published during the year 1854, the facts relating to lithotomy; and it appears that of 59 patients who underwent that operation, as many as 10 died, being in the proportion of rather more than 1 in 6.

'But here two other facts must not be overlooked, without

which no just comparison ca
operations. First, while cas
under the age of puberty, in
more affluent classes of soci
form the very great majority
hospitals; and, secondly, the
tomy among children is very
Both these facts are sufficie
had the opportunity of witn
hospitals. From the data f
which I have already referre
hospitals during the last yea
more than three-fourths of
underwent lithotomy; that a
proportion of one to fourtee
the deaths and recoveries w
the large proportion of deat
average, and depending on
well be a matter of doubt, an
rule can be drawn from the li
in the space of a single yea
hospital, where there is rea
been on the whole more su
institution, the proportion o
to have been four times as la
evident that the difference in
periods of life is very great;
mind that, in estimating the
tions, it is only the results m
into our calculation.'

There have not as yet bee
lithotrity published. Amon
of which Sir Henry Thomps
says:—

'Take, for example, the
friend, M. Civiale, during th
of his usual experience, whic
annually, and has of late
Sciences. He treated, duri
patients—66 men, 2 women,

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* *Medico-Chirurgica*

24 at Hôpital Neckar. Fifty-eight of these were operated on: 45 were submitted to lithotrity; of these 8 were partially cured, and it was successful in all the remainder but 1.

'Ten were treated by lithotomy; 3 were cured, 2 relieved, and 5 died. Three were treated by a combination of lithotomy and lithotrity; 2 were cured, the other had incontinence of urine.

'In *eleven cases* operative means have been adjourned or considered impossible.

'Now, although the lithotrity here recorded is extremely successful, every English surgeon will feel surprised to find one in every six adult cases placed in the category last named, and one half of the lithotomy cases fatal. It must be obvious to all who are familiar with the practice of this country, that nothing like this proportion of cases is adjudged unfit for operation.'

It will be seen by the tables so carefully prepared by Sir Henry Thompson, that in 1,827 cases of lithotomy, 1,116 occurred in patients between the ages of one year and twenty-one years, leaving but 717 from that period up to the age of eighty-one, and of these 462 cases occurred between fifty and eighty-one years, the period of life (at least in private practice) we are most called upon to operate for stone; and in these cases there were 115 deaths—about one in 4 cases. Now if we compare these statistics of lithotomy with those as yet given of lithotrity, it will, I think, leave no doubt in most minds which operation the surgeon should prefer, at least in the large majority of adult patients.

One of the great advantages of lithotrity is, that patients are quite ready to submit to the operation when the stone is small, and when its presence has not given rise to any serious mischief in the bladder or kidneys; when, on the other hand, an operation so serious and so dreaded as lithotomy is driven off, as a last resource.

In reviewing all the bearings of the two operations, I think there is every reason to concur in the opinion expressed by Sir Benjamin Brodie: 'My own experience has certainly led me to the conclusion that lithotrity, *if prudently and carefully performed, with due attention to minute circumstances*, is liable to smaller objection than almost any other of the capital operations of surgery. The cases, indeed, to which it is not applicable are very few indeed, and they are chiefly those in which, from the calculus having attained an unusual size, the danger and

difficulty of lithotomy are so ;
willingly, nor otherwise than as a

In conclusion, it may be well
expedient, in arriving at a decisi
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by hospital atmosphere. To ho
more importance than it is to t
considered more advisable to h
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lithotrity.

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lithotrity was making in hospi
this essay was originally going
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at this hospital made no reply t
that the return from Universit
complete, as I failed to obtain a
surgeons of that hospital. If t
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the same size, it will be seen t
ported cannot be large. The al
surgeon cannot in any great deg
by the subjoined table; from w
91 adult patients admitted, in
hospitals, with stone in the bla
lithotrity: 6 underwent no oper

PATIENTS WITH STONE IN THE BLADDER ADMITTED INTO THE LONDON HOSPITALS IN THE YEARS 1862–63.

Hospitals.	Total.	Children.	Adults.	Lithotrity.	Lithotomy.
Guy's	31	15	16	7	24
St. Bartholomew's . .	25	16	9	3	22
King's College . .	22	7	15	9	13
London . . .	17	5	12	2	15
University College .	16	6	10	5	11
St. George's . . .	13	2	11	3	8
St. Mary's . . .	12	9	3	1	11
St. Thomas's . . .	11	7	4	1	8
Royal Free . . .	7	7	—	—	7
Middlesex . . .	6	2	4	1	3
Westminster . . .	5	3	2	—	5
Metropolitan Free . .	4	1	3	—	4
Charing Cross . .	3	2	1	—	3
Sick Children . .	3	3	—	—	3
Great Northern . .	2	1	1	—	2
	177	86	91	32	139

Since the above was originally printed I received a communication from Mr. Armstrong Todd, stating that my application to the Hospital for Stone had inadvertently remained unanswered. He was good enough to forward me the following return of patients admitted into the hospital during two years, with stone in the bladder:—The total number of patients admitted were 17, viz. children, 5; adults, 12. Lithotrity performed on 2; lithotomy on 7; not operated on 8. This increases the number of adult patients with stone to 103, of which only 34 were lithotritised. From all I can learn it does not appear that lithotrity has since made much advance as an operation in London hospitals.

Sir William Fergusson in his lectures delivered at the Royal College of Surgeons in 1864 and 1865 (since published), has given his enlarged experience in the practice of lithotrity. To that work I must refer those who wish to be well informed on all that refers to this operation; but what he wishes greatly to impress on operators is the advantage of the removal of fragments by the aid of instruments. He says: 'No doubt in most cases fragments come away spontaneously in a satisfactory manner, but even in many cases these would be rapidly expedited were such means taken.' But he says the practice cannot be followed without instruments properly adapted for the purpose.

**An important communica
statistics of lithotrity since
read before the Royal Medi
Henry Thompson, on May 1
abstract.***

The author presented a series
adult, operated upon within a rec
and with the same instruments.
relating to each case, and present
preserved for inspection. His obj
crushing operation, to ascertain it
operations. Although this had n
Brodie's last communication to th
perhaps the most trustworthy and
on the subject. In order to acc
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necessary to be taken into consid
by a uniform method, within a c
were adults, and embraced muc
portant facts relative to each wer
attached to the paper as an appen
were of considerable size. And t
that so complete an opportunity
been offered hitherto, since, as far
formation of a judgment had no
this country or elsewhere.

The results of the operation w
1st. The rate per cent. of reco
death when it occurred. 2nd.
the operation. 3rd. The frequen

The chief facts relative to the
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health and constitution; that the
from other nations. The mean ag
years. The youngest was twent
thirty years. The oldest was eig
of seventy years and upward. W
and upward were reserved for l
crushed. Not one case was refus
in no instance was an operation
recoveries, reckoning every kind
per cent.; but omitting five case
mortality amounted to only 4 per
the stone was performed for 13 o
urates; 16 were mixed; 40 were
and 1 pure phosphate of lime.

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* The paper is published *in e*

The important logical conclusion to be derived from the mass of facts considered was, that lithotrity is an eminently successful operation. For a certain number of cases, its success may be regarded as a certainty—absolutely without fear of any contingency, except such as attends the minor operations of surgery—for example, the opening of a small abscess, or the passing of a catheter. For the author stated that he had never lost a patient in the whole course of his experience after crushing a stone which was no larger than a small nut; and this he considered was a size at which, with few exceptions, every stone ought to be discovered. But this very fact led the author to remark that the success of lithotrity cannot therefore be considered apart from a knowledge of the extent, in regard of the magnitude of the stone and the constitution of the patient, to which the capabilities of the operation have been pushed. When it is employed for stones as large as a date, or a small chestnut—and it is impossible to deny the excellent chance of success which this method offers to the subjects of such stones—a certain, but still only small, proportion of deaths must be expected. And the rate of mortality will correspond with augmentation in the size of the stone, and with the amount of existing disease and age on the part of the patient. Given a small stone in a fairly healthy person, and success is certain; the possibility of a fatal result in such a case depending only on the presence of those remote and excessively rare conditions which will make for an individual here and there the mere passing of a catheter a cause of death.

The rule observed had been, for the most part, to apply lithotrity to all calculi obviously less than an ounce in weight, easily discovered by sounding, and to operate on all larger ones by lithotomy.

Since this communication appeared, the number of Sir Henry Thompson's cases have reached 204, with one more death, making 13 deaths in the whole number.

CHARLES HAWKINS.

END OF THE FOURTH VOLUME.

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H74 A system of surgery.
v.4
Am.ed.
1871

NAME	DATE DUE